FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

The Future of Food Processing

AT a recent meeting of the Agricultural Inquiry Committee in Belfast, Sir Joseph Barcroft, Chairman of the Food Investigation Board of the Department of Scientific and Industrial Research, suggested that the Ministry of Food might set up a body to explore the possibilities of the newer methods of food processing, more especially on their financial side, about which he was unable to give any advice. He suggested also that such a body was likely to have ample time to carry out investigations before the home markets experienced any catastrophic competition from dried or frozen foods introduced abroad.

Sir Joseph dealt with the three principal modes of processing—canning, drying and freezing. He submitted a memorandum in which he said that, from the point of view of the Committee, there appeared to be two problems of interest: (1) Could agriculture in Ulster benefit from taking advantage of modern methods of processing? (2) Did it stand to suffer from the practice of such methods in other countries?

The starting point in the consideration of both problems was the same—namely, food must be processed when and where it was produced. The first problem then subdivided itself thus: (*a*) Could commodities, now exported, be exported to better advantage if processed? (*b*) By taking advantage of modern methods, could new and profitable markets be created? (*c*) By saving waste and extending the lifetime of produce, could the markets that existed either in or outside Ulster be stabilised in the sense of a reduction in fluctuation of prices and an assurance in the sale of produce?

The question of protection of the home markets from a flood of foreign competition was more difficult to deal with because so little knowledge was available about what was taking place abroad. Without going into high policy, he said, it was evident that for some years after the cessation of hostilities large areas would be in want. Food would be in great demand and the utterances of responsible statesmen suggested that the control of world food could not be entirely abolished for a time. The corollary seemed to follow that during that time wholesale flooding of markets was unlikely.

Employment Policy

The Government White Paper on Employment Policy (Cmd. 6527), presented to Parliament by the Minister of Reconstruction, will affect the food manufacturing industries in common with other trades and industries in the post-war period; but unlike others Papers on post-war problems which the Government have presented or are preparing, it is not primarily an outline of projected legislation.

The Government have accepted as one of their primary aims and responsibilities the maintenance of a high and stable level of employment after the war and the Paper outlines the means by which they hope to fulfil that obligation.

Of special importance to food manufacturers is the chapter dealing with "The Balanced Distribution of Industry and Labour." It will be an object of Government policy to secure a balanced industrial development in areas that have in the past been unduly dependent on industries vulnerable to unemployment. The Government will encourage the establishment of new enterprises in these "development areas."

Firms contemplating the establishment of new factories (including in certain cases extensions of existing premises), or the transfer of a factory from one area to another, will be required to notify the Government before their plans reach an advanced stage. This will enable the Government to exercise control over the location of new industrial development as contemplated by the Barlow Report. Mr. Hugh Dalton, President of the Board of Trade, stated in the House of Commons on June 7, however, that the Government do not accept, as it stands, the recommendation in that Report that new factory development in London should be prohibited. Every case will be considered on its merits, though the Government view is that London is not one of the areas where there is urgent need for factory development. The White Paper states that power will be taken to prohibit the establishment of a new factory in a district where serious disadvantage would arise from further industrial development, and that the Government will steer new factory development into areas that call most urgently for it. The Government will continue and extend the policy of erecting in development areas factories on individual or collective sites for sale or lease, including factories that can be rented in sections. Suitable firms will be afforded facilities for obtaining short-term and long-term loans and, where necessary, share capital.

The changeover from war to peace conditions may affect about 7,000,000 workers and the White Paper shows the steps by which the Government are preparing to reduce the resultant unemployment to a minimum.

The keystone of the Employment Policy is contained in the following statement: "A country will not suffer from mass unemployment so long as the total demand for its goods and services is maintained at a high level." The following three essential conditions must be satisfied, states the White Paper, if a high and stable level of employment is to be maintained:

1. Total expenditure on goods and services must be prevented from falling to a level where general unemployment appears.
2. The level of prices and wages must be kept reasonably stable.
3. There must be sufficient mobility of workers between occupations and localities.

"The first step in a policy of maintaining general employment must be to prevent total expenditure from falling away. . . . The Government are prepared to accept the responsibility for taking action at the earliest possible stage to arrest a threatened slump. This involves a new approach and a new responsibility for the State." It is considered that action taken by the Government to maintain expenditure will be fruitless unless wages and prices are kept reasonably stable. This does not mean that every wage must remain fixed at a particular level. Stability of wages and of prices are inextricably connected.

Employers must seek in larger output rather than in higher prices the reward of enterprise and good management. "There has been in recent years a growing tendency towards combines and agreements, both national and international, by which manufacturers have sought to control prices and output, to divide markets and to fix conditions of sale. Such agreements or combines do not necessarily operate against the public interest; but the power to do so is there." The Government will seek power to take appropriate action where necessary.

The importance of the export trade is also dealt with, and it is emphasised that export trade is dependent on prosperity in the overseas markets.

Will Ice Cream be Reprieved ?

Efforts that are being made to bring about the revocation of the Ice Cream (Prohibition of Manufacture and Sales) Order were described by Mr. F. F. Farage at the statutory meeting of the Ice Cream Alliance, Ltd., on May 31. He said that the Alliance had enlisted the support of a group of Members of Parliament; as a result a Parliamentary deputation waited upon Colonel J. J. Llewellin, Minister of Food, and as a special favour representatives of the Alliance were allowed to be present.

After hearing the case for the trade, the Minister said that he was not in a position to make any change in the Order, but he would instruct his officials to meet a deputation from the Alliance for the purpose of reconsidering the whole position.

The deputation subsequently met prominent officials of the Ministry on two occasions and carried the trade's case still further.

"We are in constant touch with the Members of the House who have supported us. Our case is now receiving consideration by the Minister, and up to the present we take it that no news is good news," Mr. Farage added, though he advised the trade not to be too optimistic.

"We are trying to get ice cream back free from restrictions. We claim our rights as a trade for an allocation of ingredients on the same lines as other food trades. We are not asking for anything but justice. It is a question of waiting until we get the Minister's reply, and then it will be up to the members of this Association to decide on their future course."

The meeting empowered the Provisional Council to continue in office pending the formation of divisions throughout the country and the election of members of the Council on a divisional basis.

An extraordinary general meeting of the Alliance was held on the same day, and resolved by 810 votes to 42 to delete the definition of ice cream from the Articles of Association. This was foreshadowed in the June issue of FOOD MANUFACTURE. The new organisation has 1,785 members.

Licensing of Food Traders

A resolution to the effect that "a permanent system of registration and licensing of food trades is necessary in the national interest" was unanimously adopted at a recent meeting of the National Council of the Retail Fruit Trade Federation, Ltd. Although the resolution does not directly affect food manufacturers (the term "food trades" means retail shops and large retail stores), it may do so indirectly.

One of the purposes of the proposal is to check the opening of retail fruit shops where they are not wanted. It is feared that in the absence of a licensing system after the war the number of retail fruit traders may increase in several undesirable directions. If an excessive number be allowed to operate, they would require an abnormally wide margin of profit in order to make ends meet, as the average shop would have less than its proper quantity of fruit to sell. Too many shops means uneconomic distribution and unnecessarily high retail prices. Wholesale prices would also tend to increase because an abnormal number of retailers would be competing for the available supplies. It is a reasonable assumption that jam manufacturers, fruit canners and bottlers would also have to pay higher prices both in the wholsale market and also, possibly, when buying direct from growers. From this point of view permanent registration of food traders would not be harmful to manufacturers.

The resolution embraces all food trades; we have taken fruit as an example because the proposal is that of fruit traders. The principle is the same in other food trades. But the resolution also states: "The meeting is also of the opinion that such control is necessary for the purpose of providing reasonable security and a reasonable standard of life for the shopkeeper, his family and his employees," and proceeds to urge the establishment of a permanent licensing authority.

Food manufacturers are asking whether this part of the resolution means that food traders in general are dissatisfied with their present remuneration and desire wider margins (and higher retail prices) in order to provide "a reasonable standard of living." If the laws of supply and demand are allowed to operate normally, and a licensing system permits an adequate number of retailers, it is not clear that retail margins would be excessive or that wholesale or first-hand prices would be affected. There is no evidence that the interests of food manufacturers would be prejudiced. The resolution contains no suggestion that prices should be controlled.

Dehydration in Canada

After four full years of war, Canada's infant dehydration industry has jumped from its swaddling clothes, skipped lightly through adolescent pains, and in 1943 achieved maturity. More than threescore assorted products, either powders, shavings, or nuggets, are now available for export to fighting countries all over the world, and some of them are even ready in packages small enough to suit the average Canadian housewife.

These foods fall naturally into three or four types, each of which needs a different technique for drying. Vegetables fall into two groups: leafy, such as cabbages, spinach, parsley, etc.; and roots, like potatoes, beets, turnips and carrots. Fruits also are of two main types, such as apples and stone fruits. Milk powder, the oldest form of food drying commercially practised in Canada, is now joined by egg powder, which uses a somewhat similar technique. Meat drying, except possibly in an experimental way, has not yet reached Canada, but in the United States trial shipments have been successfully sampled in the United Kingdom. Dehydrated vegetables valued at about £18,750,000, which is almost four times the total for 1942, are being produced by Canadian plants this year, mainly for shipment to the United Kingdom. Of the 6,000 tons being produced this year, 5,600 tons will go to Britain. Last year about 1,600 tons of dried vegetables were made and sent overseas.

Split up into their various parts, the anticipated production this year in tons—1942 shipments in brackets—will be: Potatoes, 4,600 (1,159); cabbage,

876 (76); carrots, 725 (78); onions, 50 (343); turnips, 425 (46). In addition, 16 tons of green beans, 60 tons of parsnips and 75 tons of beets are scheduled for shipment this year. In all, there are over two dozen plants scattered throughout all the provinces, working on Government orders for dehydrated products. British Columbia has four plants, two of which handled only vegetables—mostly potatoes; two handled fruit, but one of the latter also processes vegetables. Southern Alberta hopes to have a drying plant working on dried vegetables, while Ontario has four plants operating and one or two others in prospect. In the Maritimes, New Brunswick has two modern potato drying plants and Prince Edward Island has one, while the largest drying plant in the Dominion is now operating at Kentville, N.S. In addition, the Annapolis Valley of Nova Scotia can boast of about a dozen apple dehydrating plants. The latest addition to Canada's dehydrating industry is the new Ferdon plant at Laprairie, Quebec.

At the present time cabbages are going through the plant at the rate of about 18 tons a day, which means an output of around 1 ton of dried product. When the cabbage is finished, the plant will turn to carrots, finishing up on turnips. Between 80 and 110 people are employed in the plant. This past year around 600 acres of these crops were contracted for and it is hoped to enlarge the acreage in 1944.

Vitamin Retention in Canned Meat

At a recent meeting of the division of agricultural and food chemistry of the American Chemical Society, D. A. Greenwood, J. F. Feaster, J. M. Jackson and H. R. Kraybill reported some basic data regarding the effect of thermol processing on the retention of thiamine, riboflavin, niacin and pantothenic acid in pork luncheon meat processed in thermal death time cans (volume about 25 ml.) and in various sizes of commercial cans.

Thermal death time equipment was used to permit accurate control of heat treatments. Under the conditions of these experiments, high-temperature short-time processes were found to be decidedly superior, from the viewpoint of thiamine retention, to lower-temperature longer-time processes of equal sterilising values. Studies of this type were useful in establishing rates of B vitamin inactivation. Due to the many factors influencing heat processing, it is essential to exercise caution in projecting data obtained from such studies to commercial size cans.

The retention of B vitamins in pork luncheon meat packed in 12 oz. and 2½ lb. cans during processing at 225°, 235°, and 245° F. for times calculated to be of equal sterilising values was investigated. In these cans, processing temperature was found to have a relatively small influence on B vitamin retention.

Plant Proteins

At the same meeting, D. Breese Jones of the U.S. Department of Agriculture, in reporting on "The Nutritional and Supplementary Value of Some Plant Proteins," stated that there are several sources of plant protein which, when properly prepared and intelligently used, contain proteins having high nutritional properties and which are valuable for supplementing the protein of other foods deficient in some of the essential amino-acids. These sources include soya beans, peanuts, cottonseed, wheat and corn germ, several varieties of beans and peas, and yeast.

In the raw state, said Mr. Jones, the proteins of several legume seeds have low biological values, but when heated and supplemented with cystine or methionine they become adequate to support satisfactory growth of animals. Others require only heating, or supplementation with cystine. Heating improves the digestibility of the proteins of most legume seeds.

Riboflavin in Liver and Lungs

The Sixteenth Annual Report (1942-43) of the Agricultural Research Institute of Northern Ireland (at Hillsborough, Co. Down) has returned to the poor growth and "curled-toe paralysis" of chicks arising from deficiency of riboflavin (vitamin B_2). When chicks are provided with skim milk, shortage of this vitamin is unlikely; but standard rearing mashes must be carefully compounded so as to ensure a sufficiency of riboflavin. The official regulations therefore made it compulsory to include 10 per cent. by weight of any one or combination of the following vitamin-B_2-rich materials in rearing mashes for chicks: dried buttermilk, dried skim milk, dried whey or dried yeast. The Sixteenth Report describes experiments made to investigate the suitability of liver and lung meal to replace the foregoing constituents, which were in short supply. The soundness of the official prescription was supported, since the basal ration was definitely deficient in riboflavin, but its deficiencies were almost completely remedied by the inclusion of 10 per cent. of skim milk. Results of tests with chicks suggested that dried liver was slightly more than twice as good a source of riboflavin as was the skim milk, and that an addition of 5 per cent. of liver meal was at least as good as 10 per cent. of dried skim milk. Dried lung meal at the 10 per cent. level gave as good results as 5 per cent. of liver meal, and slightly better than 10 per cent. of dried skim. These estimates, from biological assay of the relative values, have been confirmed by chemical determinations of riboflavin contents; unfortunately the sources of the liver and lung were not reported. As an outcome of this work Messrs. Newforge, Ltd., went into production of dried liver meal.

Potato Dehydration

Among the many war-time measures taken by the Ministry of Food was the provision of special factories to dry surplus potatoes. We had the opportunity of inspecting one of the first of these factories to go into production and through the courtesy of the Ministry of Food are able to give below a description of the plant. Although originally designed for the production of potato meal suitable for animal feeding, investigations by Ministry of Food experts showed that the plants could be adapted to produce a potato meal suitable for human consumption.

THE POTATOES are delivered from the farms by road vehicles, generally in bags, and are unloaded into three large storage bunkers, each having a capacity of 250 tons. The bunkers are rectangular in plan, having vertical sides about 4 feet high of concrete slab construction, over which the bags are easily emptied from the lorries.

The concrete bottom of each storage bunker is inclined downwards from the sides to a central water duct or flume running the length of each bunker. When loading, the flume is covered with timber slats. These are removed progressively when it is required to transfer stock for processing, and this is done by shovelling the potatoes into the central flume, down which they are water-borne to an inclined conveyor, which raises them to the washing machine. The water flumes have a continuous fall from the distant end of the bunker to the conveyor, and at the point of discharge into the conveyor the water is diverted through a grid to a dirty water sump below ground.

Washing

The conveyor carries potatoes from the level of the flumes up to the washing machine, housed in an annexe to the main building and at ground level. The conveyor is of the drag link type and handles 10 tons per hour; it is driven by 3-h.p. electric motor and worm gear.

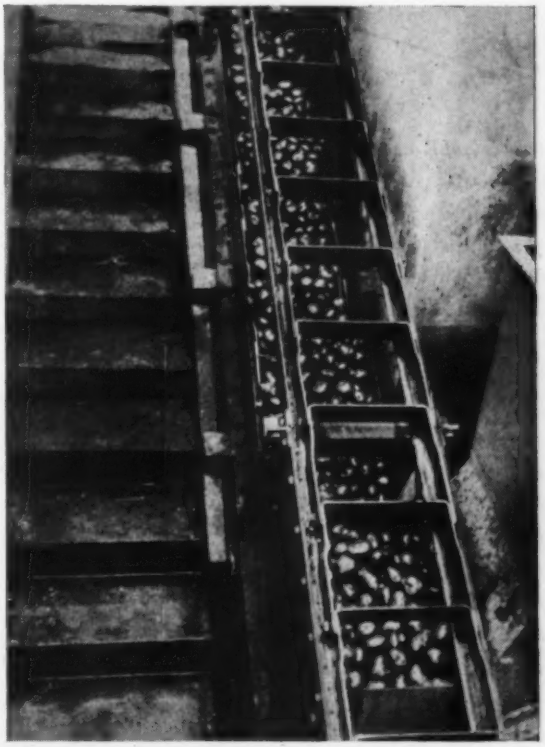
The washing machine comprises a concrete trough about 12 feet long filled with water, through the length of which the potatoes are conveyed by inclined paddle blades revolving on a horizontal shaft. The blades dip into the water and scour the potatoes, at the same time working them over weirs, which serve as stone-catchers. The potatoes are kept within reach of the paddles by a perforated partition plate, through which the silt and dirt settles down into the bottom of the trough, where it is drained once a shift through quick-opening sluice valves into the dirty water sump underground.

The washed potatoes pass out of the washer by a scoop paddle on to a short draining conveyor feeding a 70-foot bucket elevator delivering to a 50-ton overhead steel bunker carried in a tower over the main building. Access to the bunker and elevator top is by spiral staircase. The washer and draining conveyor are driven together by a 12-h.p. motor through texrope and spur gearing. The elevator has an independent 5-h.p. motor drive at the top.

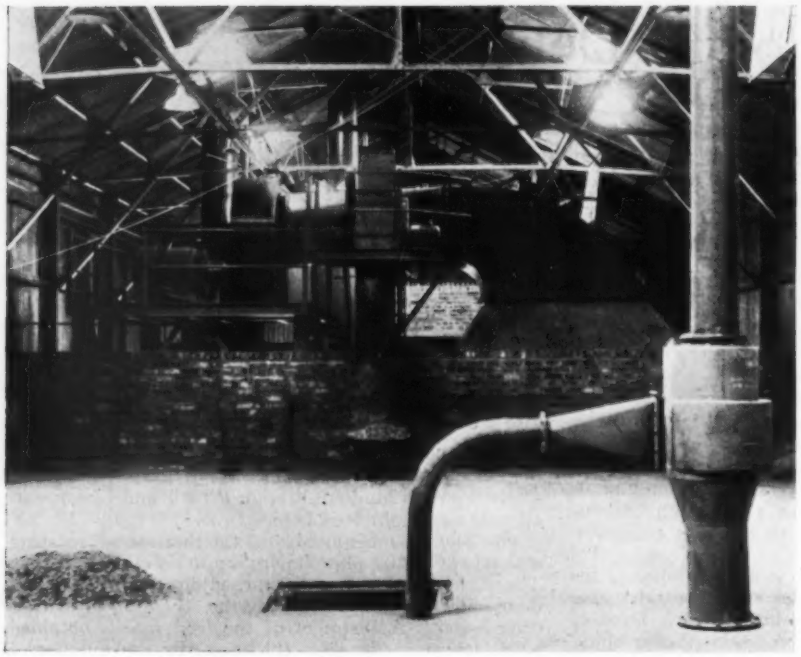
The Slicing Operation

On a concrete floor in the tower structure is mounted the slicing machine, which is fed by gravity from the washed potato bunker through a rack and pinion cut-off gate and sight feed hopper.

The slicing machine is of the horizontal rotating disc type, the disc plate having up to six cutting knives. The sliced potatoes are discharged directly through the floor into the inlet chute of the Buell rotary drum drier below. Adjustment of the feed rate is obtained by variation of the slice thickness, by the number of knives in the disc, and by a variable speed drive to the slicing disc. The normal rate of feed gives 3 tons input

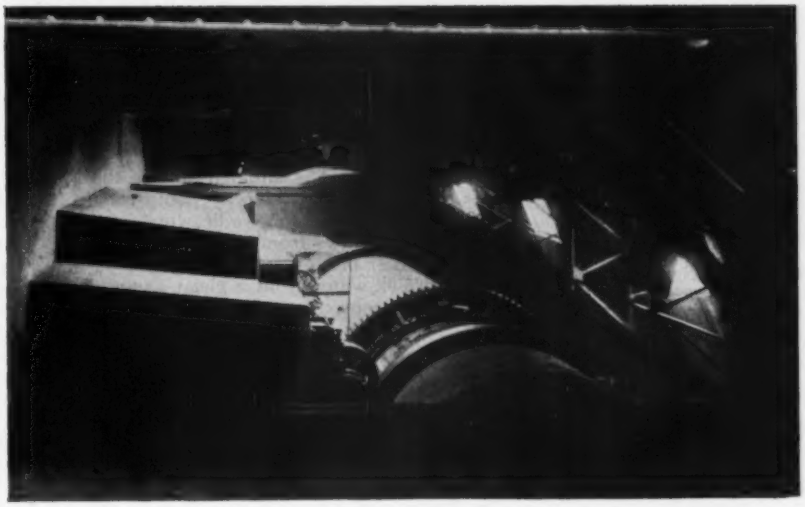


Potato Conveyor from Flumes to Washer.

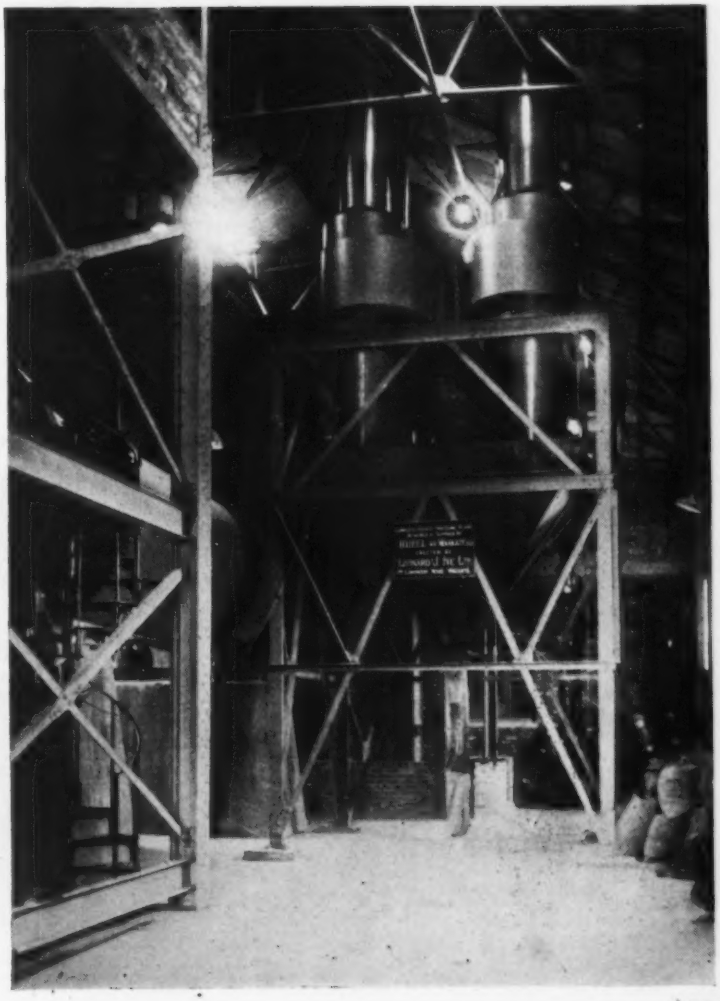


Storage floor showing Grinder Hopper and Collector. Dryer Fan and Elevator in background.

Large hand-fired furnace which is designed for burning anthracite cobbles and is provided with three firing doors on one side and with six adjustable air inlet ports. The furnace operates under induced draught from a large multivane-type fan drawing the gases and air through the drum. This fan is mounted on an overhead platform and is driven from a 50-h.p. slip-ring motor by tex-ropes.



The drier is direct heated from a large hand-fired furnace and operates on the uniflow principle, whereby the products of combustion and hot air pass through the drum in the same direction as the material to be dried. The dried slices pass out of the drum by way of an adjustable governing device in the end of the drum into a large outlet hood and by way of an 18-inch diameter ribbon flight screw conveyor and bucket elevator to the first floor of the storage and milling house.



General view in drier house showing Buell Drier and Separators.

The drier is of standard design fitted with the Buell "Buttner" cross-shaped internal distribution system. It has a diameter of 6 feet 10 inches and length of 35 feet. It is fitted with two running rims mounted on four supporting rollers and driven by a large girth gear and pinion through secondary gears and texrope from a 25-h.p. slip-ring motor.

of wet sliced potatoes per hour, with a slice thickness of about 3/32 inch.

The Drier

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Dust Separation

The dust-laden air from the drum drier, after leaving the fan, passes to a Buell dust separator unit consisting of four special high-efficiency Buell (Van Tongeren) separators in parallel. They are of relatively small diameter and patented design. The cleaned gases from the cyclones pass directly out through the building roof by way of four independent chimney-stacks, while the collected dust, which contains a considerable proportion of starch, is collected in a common hopper and bagged.

The dried slices discharged from the drier by the bucket elevator are delivered direct to the feed hopper of a high-speed disintegrator, texrope driven by a 25-h.p. motor, the ground product being collected in a Buell cyclone and delivered to two bagging-off spouts. Bagging is carried out on the ground floor, and delivery of the ground meal is made direct to lorries. The meal is generally ground to pass 1/16-inch mesh screen.

The pumping plant is situated outside the building, three 5-inch centrifugal full-way pumps being housed well below ground-level to give drowned suctions. One pump normally draws from the dirty water sump and delivers to either one of two settling ponds; the other normally draws water from a clean water sump supplied from adjacent stream or river and delivers to the head valve at each bunker flume and to the washing machine. The third pump is connected to act as stand-by for either service, and fire hydrant connections throughout the factory can also be served by these pumps.

A percentage of the incoming bags of potatoes in each load are check-weighed and sampled by an inspector.

The dried ground meal is weighed at the bagging point into 1-cwt. jute bags for distribution.

The plant inspected had been in operation for about five months, working 24 hours per day. The rated capacity is 500 tons raw potatoes per 168-hour week, and on acceptance tests the plants were shown capable of producing continuously 12 to 13 cwts. of finished product per hour at 12 per cent. moisture. Handling and washing of the whole potatoes is generally confined to two shifts, while drying and grinding proceeds continuously; sufficient storage is available in the 50-ton bunker to carry over the night shift.

NOTE.—The plants were designed, supplied and erected by the *Buell Combustion Co., Ltd.*

Pumps by the *Pulsometer Engineering Co., Ltd.*

Disintegrating mills by *Christy and Norris, Ltd.*

Slicing machine by the *Beet Sugar Equipment and Engineering Co., Ltd.*

Motors by *English Electric Co., Ltd.*, and *Laurence Scott and Electromotors, Ltd.*

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Fluorescence Analysis in the Food Industry

PART V

This concludes the series of articles covering the subject. Previous parts were published in the November (1943), January, March and April (1944) issues of FOOD MANUFACTURE

J. A. RADLEY, M.Sc., F.R.I.C.

FLUORESCENCE ANALYSIS IN THE DETECTION AND ESTIMATION OF VITAMINS

Vitamin A

R. S. Morgan[207] examined a number of fats containing vitamin A, and found they all gave a yellow fluorescence which seemed closely connected with the presence of the vitamin. The fluorescence of olive oil has been ascribed by Van Raalte[252, 253] to the presence of vitamins, vitamin C or a related substance being suggested by J. A. Pierce[254, 255] and by G. Loew[256, 257] as the seat of the fluorescence in this case. P. R. Peacock,[258] however, points out that there is a number of discrepancies between the vitamin A content and the fluorescence of butter and other fats, and that there does not appear to be any connection between the vitamin D content and the fluorescence, conclusions which are supported by Morgan and others.

J. Woodrow and A. R. Schmidt[259] have attempted to correlate the fluorescence of spinach, butters, tomatoes and other foodstuffs with the vitamin A or carotene content. The fluorescence of both these substances contains the lines 5300-7300 and 4100-5100 A.U. in common. Generally, however, it is the power of vitamin A to absorb ultra-violet light that is employed for its determination in food and biological laboratories. The author has previously reviewed this work in these pages.[260] At present no certain conclusions can be drawn between the appearance of a yellow fluorescence in a foodstuff and the presence of vitamin A.

The green fluorescence of vitamin A has been used by H. Popper[261] to detect its presence in biological material following feeding experiments. This worker examined thin pieces of the livers from the experimental animals, checking his results by chemical and biological methods. He confirms the observation of Von Querner and others that the green fluorescence of this vitamin disappears rapidly during irradiation with ultra-violet light, the colour fading to blue. In a second paper, Popper describes his results on human livers, following the distribution and ultimate fate of the vitamin in this organ.[262]

Carotene

It is interesting to note that the addition of carotene to refined olive oil changes the blue fluorescence of the latter back to a yellow fluorescence resembling that of virgin olive oil, a fact that makes the detection of adulteration of virgin with refined oil very difficult if carotene has been added as a " masking agent ". The application of the fluorescence technique for the estimation of carotene does not appear to have been attempted, and although many modifications of the technique of extraction, developed by Willstater and Stoll in 1913, followed by the determination of the carotene concentration using a photo-electric or other colorimeter, have been published, nothing strikingly new appears to have emerged since the publication of the original method.

Vitamin B_1

D. J. Hennessy[263] has surveyed the chemical and fluorometric methods for the estimation of vitamin B_1, and concludes that the latter are more suitable, especially where low-potency materials are being examined.

The reproducibility of the methods are approximately the same, an average deviation of below 5 per cent. being obtained.

In 1936 Jansen[264] first suggested that vitamin B_1 could be measured quantitatively by conversion into thiochrome with alkaline ferricyanide (as shown by Barger *et al.* in 1935[265]) and measuring the vivid blue fluorescence of this compound which can be seen at dilutions of 1 : 2,000,000. Jansen's method consists briefly in converting the vitamin B_1 into thiochrome and measuring the fluorescence with a photo-electric cell. With some foodstuffs certain difficulties were found in applying the method. Karrer and Kubli[266] found that for preparations of high activity visual comparison of the intensity was preferable to the use of the somewhat delicate fluorometer of Cohen,[267] which has been used by a number of workers in this field. The preparations of Karrer and Kubli contained between 500 and 220,000 I.U. per gram., and had been prepared during the production of crystalline, natural and synthetic vitamin B_1. However, in the case of estimation in foodstuffs, this visual comparison is not sufficiently accurate.

Wang and Harris[268] and Pyke[269, 270] have developed the method for foodstuffs, whilst Westenbrink and Goudsmit[271, 272], Hills,[273] and Karrer[274] among others have developed the process for urine. R. G. Booth[275] later selected Pyke's method as being basically the most suitable for foodstuff estimations, and applied a modified form of it to the estimation of vitamin B_1 in cereals.

Booth avoids the difficulty that the total digestion of the sample taken is incomplete by preparing two digests of each sample, one of which contains a known amount of added vitamin B_1 added previous to the digestion. The amount of added vitamin then found in the aliquot of the " fortified " digest bears the same relation to the theoretical amount which would have

been found had digestion been complete as the natural content found bears to the true vitamin B_1 content of the foodstuff when calculated according to Pyke's assumption. Booth found that addition to the digest of the methyl alcohol, caustic soda and ferricyanide, in that order, with stirring by a stream of nitrogen, avoided the incomplete oxidation of the vitamin often found when these reagents were mixed prior to addition to the digest. The use of a photo-electric cell and filter in lieu of visual comparison gives a much closer agreement between duplicates and a greater overall accuracy (Hill, Booth). It may be of interest to mention briefly the results obtained by Booth. The vitamin B_1 content of 88 wheats bore no consistent relation to species except in the case of *T. durum*, and the conditions of soil, climate, manuring or the growing period on the vitamin B_1 content appears small; there is no loss of vitamin after 10 years' storage, and there is little or no cocarboxylase- or protein-bound vitamin B_1 in wheat.

M. Pyke[269] had previously pointed out that, although results which compare closely with the biological assay can be obtained with crystalline vitamin B_1 and adsorbates of the vitamin on acid-clay, the assessment by chemical methods on certain foodstuffs is significantly lower than that given by the biological method. Certain proprietary yeast preparations have a blue fluorescence unaltered by the oxidation step in the thiochrome method. By fluorometric methods their vitamin B_1 content would appear to be zero, but it is known that they possess the usual activity of 6-10 I.U. Pyke suggests that the quantitative recovery of crystalline vitamin B_1 which has been added to the substance under investigation cannot be taken as evidence that the results obtained by the thiochrome method are a complete measure of the total amount of vitamin B_1 and its biologically active compounds present, because vitamin B_1 pyrophosphate, which may be present in certain foodstuffs, is insoluble in the isobutanol used to extract the vitamin from the "digested" material prior to the estimation. Vitamin B_1 pyrophosphate, which appears to be of fundamental biological significance, and the suggested combination between vitamin B_1 and protein are unlikely to appear in the extract on which the determination is carried out. The results of M. A. Pyke[270] using a modified Jansen procedure may be of interest in showing the percentage recovery obtained with vitamin B_1 determined chemically and by biological assay. (See Table 1.)

TABLE 1.

Substance.	*Percentage Recovery of added Vitamin B_1*
Milk	102
Ham	100
Wheat germ	103
Urine	110

Substance.	*Chemical Method.*	*Units/Gm. Biological Assay Method (Baker and Wright).*[276]
Dried brewer's yeast ...	13	6–23
Egg white	Nil	Trace
Egg yolk	1·6	1·4
Rice bran	5·4	5·6–7·4
Wheat germ A ...	5·6	5·9–18·7
Wheat germ B ...	8·0	—
Rat liver	0·8	1·5
Rat kidney	0·2	0·2 (Leong)
Rat muscle	0·6	0·4[277]

The consensus of opinion among workers in this branch of fluorescence analysis appears to be that the method compares very favourably in accuracy with the biological method, and it has obvious advantages over the latter if this is true.

A. Mallinckrodt-Haupt uses Jansen's method, but the fluorescence of the thiochrome is compared in the photometer with a standard of fluorescent glass. The range of determination can be 2-250 gamma, according to this worker, if acetic acid (2 ml.) is added to the isobutanol (4 ml.) solution of the thiochrome. The fluorescence is thereby changed to green and can be read over a greater range of the instrument.

Recently it has been proposed to have a standardised method for determining vitamin B_1 in flour, and the question of the filters used has also been discussed by several workers.[279] An instrument which can be bought ready-made as a standard unit, requiring only connection to A.C. mains, and one which is self-compensating for variations of line voltage, which have been found to be troublesome in the apparatus of some workers, is the Spekker Photo-Electric Fluorimeter. This instrument makes use of a null method with an optical-mechanical system which is both precise and simple. It is independent of fluctuations of line voltage in the illuminating system and of deviations from a linear response of the photo-electric cells and galvanometer circuit. The source of illumination is a small mercury vapour discharge lamp fitted with a Woods filter, which cuts out much of the visible light, but allows radiation of a wave-length at 3,650 A.V. and 3,680 A.V., both of which are near the absorption peak of aneurine, to pass freely. The light passing through this filter is split into two beams, one going directly to a compensating photo-cell, the other passing through a calibrated variable aperture and into the cell containing the vitamin B_1 solution. This solution cell is in close juxtaposition to a second photo-electric cell which receives only fluorescent light from the solution. Scattered radiation is eliminated by a special filter fixed in front of the photo-cell, which is not in the direct path of the ultra-violet radiation. The two photo-cells are connected differentially with a sensitive but robust galvanometer which is claimed to be relatively free from disturbances from moderate vibration. It requires a path length of 2 metres, as it is used in conjunction with a lamp and scale. The capacity of the solution cell is about 18 c.c. The instrument is first calibrated, using several solutions of known strength, and, once accomplished, the calibration requires checking only at long intervals. In the determination of vitamin B_1 the cell is filled with a strictly reproducible standard solution of thiochrome from crystalline vitamin B_1, and another cell, which rides on the same slide so that either cell can be brought into position at will, contains a similarly treated unknown solution, and readings first with the known and then with the unknown solution are made. This instrument is of particular value, as it may readily be converted to a Spekker Absorptiometer, when it may be used for the estimation of coloured solutions.

Some precautions must be observed to get the most accurate result whatever fluorometer is used. The stability of the thiochrome solutions is increased by storing them in an atmosphere of nitrogen and, as

they are not too stable to ultra-violet radiation, in making the observations with the best dispatch. In those instruments where quinine sulphate solutions are used as standards for comparison it should be remembered that this, too, is unstable to ultra-violet radiation on repeated exposure. The vessels for storing the thiochrome solution should be glass-stoppered or, if corks are used, they should be covered with tinfoil, as the solution extracts a fluorescent material from the cork.[278] There is another point about the quinine sulphate solutions that might prove important, although, to the present author's knowledge, it has never been observed in practice. This is, that " soft " glass bottles can impart an appreciable alkalinity to water stored in it for any appreciable length of time. If such a bottle contained quinine sulphate solution, the sulphate would gradually be changed to sodium sulphate, with a tremendous drop in the intensity of the fluorescence of the solution. This neutralisation or reaction between the sodium from the glass and sulphuric acid in combination with a weak base can readily be observed in cheap bottles of ink. Here the ferrous sulphate and the tannins of the galls are kept in solution as long as sufficient free sulphuric acid is present to give the correct *p*H value. When this acid is removed by reacting with the sodium ions from the glass the insoluble iron tannate precipitates and forms a black sludge often found in the cheaper bottles of ink. Wokes[281] has pointed out that in constructing calibration curves for thiochrome, quinine and other fluorescent compounds it has been found that these are linear over a short range only. Moreover, the slope of the curve may vary with the content of a non-specific fluorescent substance present, so that a curve giving good results with one type of material may not be as suitable for a different material. It should be possible to overcome this difficulty by using two standards, one being twice as strong as the other. If these points are borne in mind together with the fact that the instrument should be so constructed as to nullify, or reduce to a minimum, the fluctuations in the line voltage of the ultra-violet light source, the method can be confidently recommended.

Vitamin B_2 or Riboflavin

Vitamin B_2 has a bright green fluorescence in aqueous solution, and can be estimated without a previous chemical transformation such as is required in the case of vitamin B_1, as with the latter vitamin it can be estimated by use of the Spekker Fluorimeter or by the fluorimeters described by Cohen,[207, 282] Supplee,[283] S. M. Weisberg and I. Levin.[284] The method of the last-named workers has the features of simplicity and cheapness, requiring only inexpensive fluorescent standards which are dilute solutions of the dyestuff fluorescein. These standards are calibrated by means of a solution of synthetic riboflavin, and thereafter are readily made up when required. Nine small argon bulbs are wired in rows of three in a box, and the lid of the box consists of a 6·5-inch square Corning glass Violet Ultra No. 586. The purified unknown solution is diluted so that the content of riboflavin lies between 0·1 to 1·0 gamma per c.c., and the various dilutions are multiplied by the dilution factor to determine the flavin content. Various dilutions of the unknown solution are made up to 50 c.c. in 2-oz. French square bottles, which are placed on the filter glass lid of the box, together with the sodium fluoresceinate standards in similar bottles, and the comparison carried out. Suitable procedures that can be adapted wholly or in part to obtain the purified riboflavin are given by S. M. Weisberg and I. Levin,[284] Booher,[285] Seidell,[286] Supplee and co-workers,[287, 288] Bisbey and Sherman,[289] and Itter *et al.*[290]

It would appear that some care must be exercised when using the fluorescence assay for riboflavin that it really is the flavin which is responsible for the green fluorescence. Thus, black pepper was found by G. E. Shaw and H. C. Hind to be devoid of riboflavin by one method of assay, but by fluorescence assay a substance with green fluorescence gave very high but false values. The solubility characteristics of this substance, which is possibly piperine, differ from those of riboflavin. In water, alcohol and chloroform solutions of piperine at 1 : 2 million dilution the fluorescence colours are strong green, light blue and violet-blue respectively. The fluorescent material in black pepper behaves in the same way, whereas riboflavin fluoresces green in both water and alcohol, and luminoflavin fluoresces green in all three solvents. Thus, when dealing with a material of unknown fluorescent behaviour, it appears advisable, according to Shaw and Hind, to define riboflavin as a substance with a green fluorescence which is insoluble in chloroform and which, after exposure to ultra-violet radiation in N/2 sodium hydroxide, becomes chloroform-soluble without loss of fluorescence.

G. N. Murphy[291] found, for 40 foodstuffs, a close agreement between the figures obtained by biological assay and by fluorescence assay, whilst Hand and Sharp[292] found the riboflavin content of some 400 samples of cow's milk to range from 0·6 to 3·42 mg./l. by the fluorimetric assay.

When the flavins were first isolated from various sources, they were named according to the source—*e.g.*, " lactoflavin " from milk, " ovoflavin " from eggs, etc. Subsequent work has shown that they are all identical, and the name " riboflavin " is generally used, since *d*-ribose is contained in the molecule. C. H. Whitnan *et al.*[293] have elaborated a simplified fluorescence method for determining riboflavin in milk. They suggest adding 15 ml. of 10 per cent. trichloracetic acid to 10 ml. milk and, after standing 30 to 60 minutes, centrifuging for 5 minutes at 2,000 r.p.m. The resulting serum is neutralised, with methyl red as indicator, and the sample diluted until it can be matched under the lamp against standard flavin solutions containing 0·12 to 0·06 gamma of flavin (Labco P.X. grade) per millilitre. The results thus obtained are said to compare favourably with those obtained by the older and more established methods. This method is of interest, as it has been suggested[294] that lactoflavin may be a possible contaminant in " vitamin-free " diet, as most commercial caseins and even some " purified vitamin-free " caseins contain lactoflavin, the presence of which may readily be demonstrated under the lamp, using the proper conditions.

M. Deribere[295, 296] has dealt with the fluorescence of lactoflavin and those flavins occurring in wines, yeast and bacteria. He considers[295] that in the presence of other fluorescent substances they are best detected by means of the spectroscope, but it is often possible to eliminate the disturbing factors by changing the *p*H or the *r*H values of the solution, or by using colour filters to examine the fluorescence, or, again, by suppressing the fluorescence of the interfering compounds by a chemical reaction.

The fluorescence test, therefore, appears to offer a more rapid method of estimating vitamin B_1 than the biological methods, and at the present time there is an increased interest in possible sources, as well as in the biological properties of this vitamin, which may well be stimulated by a rapid method of assay. Where differences are found between the results obtained by the biological or feeding test, the fluorescence test, and the microbiological test, they are, as might be expected, with respect to samples of low potency.[297] Check tests between the fluorescence and microbiological methods show close agreement,[298] although duplicate tests gave variations up to 10 per cent. Satisfactory results could not be obtained with those substances which give extracts containing large amounts of light-absorbing impurities, as, for example, molasses. Most of these interfering substances are claimed, by Hodson and Norris,[299] to be removed by their technique.

Swaminathan[299, 300] has recently made a critical study of the fluorescence assay, introducing improvements in the extraction and the estimation techniques and corrections for errors due to fluorescent impurities. His results agree well with existing biological assay data. Najjar[301] has also described an improved fluorimetric method for riboflavin in urine. Some workers[301-306] have determined riboflavin by converting it to lumiflavin by irradiation in alkaline solution, followed by determining the fluorescence of the lumiflavin.

The fluorescence technique does not appear to have been applied to vitamins other than those already discussed, but it is by no means improbable that the future may see the development of suitable methods based on their conversion by chemical methods to fluorescent compounds.

Enough has been said in the foregoing to show the wide scope of fluorescence analysis. It requires to be used with caution, but yet applied with imagination, and it is worthy of close study by all who have specific or general problems in their laboratories or works. The following bibliography makes no claim to completeness, but will serve to indicate the diversity of work already carried out.

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REFERENCES

[239] M. Déribéré, *T.I.B.A.*, 1936, **40**, 557 (Detection of β-naphthol).

[240] H. J. Vlezenbeek, *Pharm. Weekblad*, 1937, **74**, 127 (Dulcin and saccharin).

[241] E. Tommila, see *Brit. Chem. Abs.*, 1934, 758 (Formaldehyde).

[242] C. Dhéré, Abderhalden's "*Handbuch der biologischen Arbeitsmethoden*", II, **3**, 4, 1933 (Fructose).

[243] E. Abderhalden, *Biochem. Handlex.*, 1911, **2**, 313, 360.

[244] G. Klein and H. Linser, *Osterr. Bot. Zeit.*, 1930, **79**, 125 (Dextrose).

[245] Schulze, *Zeit. Physiol. Chem.*, 1890, **14**, 522 (Isocholesterol).

[246] J. Bruckner, *Biochem. Zeit.*, 1934, **270**, 346 (Irradiated ergosterol).

[247] Meesemaecker, *Compt. rend.*, 1930, **190**, 216 (Irradiated ergosterol).

[248] O. Rosenheim and R. Callow, *Biochem. Jour.*, 1931, **25**, 74 (Isoergosterol).

[249] F. Feigl, "*Qualitative Analysis by Spot Tests*", 1939 (Various compounds).

[250] E. Eegriwe, *Zeit. anal. Chem.*, 1932, **89**, 121, 123, 125 (*Glycollic, malic and tartaric acids*).

[251] E. Eegriwe, *ibid.*, 1933, **95**, 325, 326 (Lactic and tartaric acids).

[252] A. van Raalte, *Chem. Weekblad*, 1928, **25**, 544 (Vitamins and fluorescence; olive oils).

[253] A. van Raalte, *Zeit. Unters. Lebensm.*, 1928, **56**, 195 (Vitamins and fluorescence; olive oils).

[254] J. A. Pierce, *ibid.*, 1930, **59**, 94 (Vitamins and fluorescence; olive oils).

[255] J. A. Pierce, Johns Hopkins Univ., 1930, August 6 (Vitamins and fluorescence; olive oils).

[256] G. Loew, *Ind. Olii min. grassi.*, 1929, **9**, 184 (Vitamins and fluorescence; olive oils).

[257] G. Loew, *ibid.*, 1930, **10**, 140 (Vitamins and fluorescence; olive oils).

[258] P. R. Peacock, *Lancet*, 1926, **211**, 328 (Vitamins and fluorescence; butters).

[259] J. Woodrow and A. R. Schmidt, *Phys. Rev.*, 1933, **43**, 379 (Vitamin A content of foods).

[260] J. A. Radley, *Food Manuf.*, 1941, 283 (Vitamin assay).

[261] H. Popper, *Soc. Expt. Biol. and Med. Proc.*, 1940, **43**, 133 (Vitamin A detection).

[262] H. Popper, *ibid.*, No. 2, p. 234 (Vitamin A detection in human liver).

[263] H. J. Hennessy, *Ind. Eng. Chem. Anal. Ed.*, 1941, **13**, 216 (Vitamin B, assay).

[264] B. C. P. Jansen, *Rec. Trav. Chim.*, 1936, **55**, 1046 (Thiochrome method for vitamin B_1).

[265] Barger, Bergel and Todd, *Nature*, 1935, **136**, 259 (Thiochrome method for vitamin B_1).

[266] W. Karrer and Kubli, *Helv. Acta. Chim.*, 1937, **20**, 369 (Vitamin B_1).

[267] E. H. Cohen, *Rec. Trav. Chim. Pays-Bas*, 1935, **54**, 133 (Fluorimeter).

[268] Wang and Harris, *Biochem. Journ.*, 1939, **33**, 1356 (Thiochrome method for foods).

[269] M. Pyke, *Nature*, 1938, **141**, 1141 (Thiochrome reaction; foods).

[270] M. Pyke, *Biochem. Journ.*, 1937, **31**, 1958 (Thiochrome reaction; foods).

[271] Goudsmit and Westenbrink, *Nature*, 1937, **139**, 1108 (Thiochrome reaction; urine).

[272] Westenbrink and Goudsmit, *Rec. trav. chim.*, 1937, **56**, 803 (Thiochrome reaction; urine).

[273] Hills, *Biochem. Journ.*, 1939, **33**, 1966 (Modified Cohen fluorimeter).

[274] W. Karrer, *Helv. chim. Acta.*, 1937, **20**, 1147 (Vitamin B_1 assay; urine).

[275] R. G. Booth, *J. Soc. Chem. Ind.*, 1940, **59**, 181 (Thiochrome method; wheats).

[276] Baker and Wright, *Biochem. J.*, 1935, **29**, 1802 (Vitamin B_1 biological assay).

[277] Leong, *ibid.*, 1937, **31**, 367 (Vitamin B_1 biological assay).

[278] A. Mallinckrodt-Haupt., *Klin. Wochsch.*, 1939, **18**, 467 (Fluorescent glass standards).

[279] A. Mallinckrodt-Haupt., *Analyst*, 1942, **67**, 162 (Filters for aneurine determinations).

[280] Anon., *Chem. Age*, 1942, 113 (Spekker Photo-Electric Fluorimeter).

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Milk and the Consumer*

PART I

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ALTHOUGH the literature of milk has been very extensive in the last 20 years, papers have usually been written from the highly specialised points of view of the biochemist, the bacteriologist, the public health official, the producer or the distributor. This paper attempts to give a survey of the present position from the point of view of the consumer, and deals with the dairy industry, milk in relation to food, the pasteurisation controversy and the future of the industry.

The Dairy Industry

By milk we usually mean the milk of the cow, and the dairy industry is not only one of our largest food industries, but one of the largest of all industries. The total capital value of the dairy farming industry has been estimated at over £460,000,000; it employs about 400,000 workers and produces about 1,300,000,000 gallons of milk annually, equivalent to 725,000 tons of dry weight food which is 100 per cent. digestible. The average price per gallon in 1937-38 was 1s. 2d. and the total sale value about £70,000,000. At this time, of about 40,000,000 acres in England and Wales, about 16,000,000 acres were down to permanent grass and 9,000,000 acres were arable, and of a total of nearly 7,000,000 cattle about 3,000,000 were cows and heifers, of which about 2,240,000 would be in milk.[1, 2] An average cow produces 44 cwt., or 484 gallons, in a year, equivalent to three or four times its own weight. Of the milk produced, slightly over 70 per cent. was sold as liquid, and the remainder converted to butter (7 per cent.), condensed milk (6·5 per cent.), cheese (5 per cent.), fresh cream (4 per cent.), milk powder (1·25 per cent.), tinned cream (0·75 per cent.), and 0·5 per cent. to other products.[3]

The distributive side is not less important; it employs nearly 100,000 workers and has a capital value of about £130,000,000. The retail sales of liquid milk in 1940-42 were £125,000,000, and of dairy produce in 1937-38 nearly £30,000,000.[1] It has been calculated that it takes one man and £800 capital to bring 10 gallons of milk daily from the cow to the consumer.[3]

Milk in Relation to Food

In Table 1 are shown the total food consumptions in this country, and in Table 2 these are expressed as lbs. per head per week. It will be seen that we consume roughly the same weight each of cereals (including flour), potatoes and milk (about 4½ lbs.). Meat is eaten to the extent of about 2½ lbs., and sugar and other vegetables and fruit to the extent of 1 to 1½ lbs. per week. Bearing in mind that milk, vegetables and fruit are largely water, our foods fall quantitatively in the following order of importance: first, cereals (including flour); second, potatoes, milk and meat; and, third, other vegetables. Fruits and sugar are of such specialised value that they cannot strictly be compared with the five major foods. It is of interest to note that, although milk is a liquid, its water content is less than that of some vegetables and fruits. It may be emphasised that cow's milk was not intended by Providence for the nourishment of human beings; man found that the cow was the most convenient animal to domesticate for milk. The dairy industry is, therefore, in a sense an artificial industry, and the modern dairy cow gives up to ten times as much milk as it would do under natural conditions. In some hilly countries sheep and goats form the chief source of milk for human consumption.

Average Expenditure on Food

The average expenditure on food per household in 1939 was about 32s. (or 9s. per head),[5, 7] Using Professor Mottram's chart[6] for the utilisation of this amount on various types of food, we get the result shown in Table 3. In some areas as much as a quarter of the households spent less than 5s. per head on food.[5, 7] It is obvious that in these cases it was almost impossible to avoid malnutrition, the corresponding cost of the B.M.A. standard diet being 6s. 8d. Of the total persons included in Murray and Rutherford's survey, 21 per cent. were below the "poverty line", and of the children 39 per cent.[7] The percentage of these cases increased with the number of children in the household, so that malnutrition is found where it is most undesirable.

Dietetic Value of Milk

In discussing the value of milk in the diet, the fundamental consideration is, of course, the requirements of each type of person for the different constituents of food. Table 4 shows the dietary needs according to a very recent estimate.[8] The greatest contribution of milk is its calcium and vitamin B_2 (riboflavin) and protein, and to a less extent vitamins A, B_1 and C; for a five-year-old child the order is roughly the same, except that the riboflavin content is relatively much more important[9] (Table 5). Milk is poor in iron, copper and other trace elements, but the young suckling has several months' supply stored in the liver. Milk is also poor in vitamins B_1 and D and rather poor in C. The nutritive values of common foods are given in Table 6. In considering the relative value of foods, we should take into account not so much the absolute content of the food, but how much is the usual amount eaten daily. For example, potatoes may be much poorer in vitamin C than oranges, but we normally eat more potatoes than oranges. Cost

* This paper is an amplified form of a lecture to the Food Education Society at the London School of Hygiene on March 20, 1944.

is also of prime importance, and in Table 7 are given the costs per unit of nutrient. It will be seen that, although milk is not specially cheap as a source of essential constituents in general, it is not excessively expensive for anyone, and is specially cheap for calcium, phosphorus and potassium. Cheese, which we can regard as a concentrated milk, is cheap for protein, fat, calcium and phosphorus.

For the sake of those not familiar with scientific tables, we have compiled a simple chart illustrating the usual deficiencies in a typical peacetime diet, and showing how effective milk, cheese and fruit are in supplementing the inadequate diet (Table 8).

The consumption of liquid milk in various countries is illustrated in Table 9. In Gt. Britain consumption of milk and cream in 1930-34 was nearly ½ pint milk equivalent per head per day—roughly half that of the United States. To-day our consumption of liquid milk is estimated to be 75 per cent. greater than in 1933 (Table 10).

It has been shown by many observers that milk consumption is related to income, and Crawford[5] has published some very interesting data on this aspect. Consumption rises steeply as we pass from the lowest social grade to the skilled artisan class, and still rises, but more slowly, as we pass to the wealthy classes (Table 11). The proportion of families using fresh milk for different purposes is shown in Table 12, and the frequency of use in Table 13. The effect of income on the consumption of condensed milk is exactly the reverse of that for fresh milk. The consumption of butter follows a similar course to that for fresh milk, while that for margarine shows a slight fall with increasing income. The consumption of cheese rises slightly with income (Table 11).

The Exaggerated Importance of Fat in Milk

The importance of the fat in milk is overrated by the public, especially by the housewife. This is, of course, understandable, as for cooking, addition to fruit, etc., the fat component is the most valuable from the appearance and "body" point of view. Moreover, it is the only constituent of milk which readily separates

TABLE 1

FOODSTUFFS FOR HUMAN CONSUMPTION IN THE UNITED KINGDOM

Average of the two years 1934 and 1935.[4]

(Products manufactured from imported materials—*e.g.*, flour, margarine and chocolate—are treated as imported.)

Commodity.	*Home Production (1,000 Tons).*	*Per Cent. of Total Supply.*	*Imports Less Total Exports. (1,000 Tons).*	*Total Quantities available for Consumption (1,000 Tons).*
Total cereals	575	12·8	3,922	4,427
Total meat	1,503	49·1	1,559	3,062
Total fish	838	88·0	115	953
Milk and Dairy Produce:				
Milk, fresh (million gallons)	910	100·0	—	910
Milk, condensed whole	92	92·0	8	100
Milk, condensed skimmed	53	41·4	75	128
Milk powder	13	52·0	12	25
Butter	53	10·0	476	529
Cheese	63	31·0	140	203
Cream	33	89·3	4	37
Lard	19	10·0	181	200
Margarine	—	—	169	169
Eggs in shell (millions)	4,700	67·1	2,307	7,007
Eggs in shell (thousand tons)	(262)	67·1	(128)	(390)
Eggs, liquid, dried and frozen	—	—	40	40
Total fruit	550	22·6	1,882	2,432
Vegetables:				
Potatoes	4,500	97·2	129	4,629
Dried beans, peas and lentils	15	10·2	132	147
Green lentils	200	99·5	1	201
Other vegetables (including tomatoes and rhubarb)	1,600	78·8	432	2,032
Preserved vegetables	—	—	45	45
Sugar, etc.:				
Sugar (in terms of refined)	530	27·9	1,368	1,898
Molasses	—	—	32	32
Glucose	—	—	24	24
Honey	1	2·50	3	4
Beverages:				
Tea	—	—	195	195
Coffee	—	—	15	15
Cocoa, chocolate powder and cocoa products	—	—	68	68

and so is obvious to the eye; the housewife tends to judge by the cream line not only the amount of fat in the milk, but also the general richness of the milk. This is, broadly speaking, sound, as milk rich in fat is usually rich in solids not fat (protein, etc.). The cream line is not always a reliable method of estimating fat; Jersey and Guernsey milks, with their yellow fat and large fat globules, always give a marked cream line in a short time, whereas Ayrshire milk, which is somewhat richer than Shorthorn milk, suffers relatively in a cream-line comparison because of its lack of pigment and small fat globules, which require much longer to rise. Cream line has been, perhaps, the most important selling point of milk; some hold that a good cream line counts more than a good keeping quality. This aspect has had a close association with the introduction of glass bottles.

The nutritive value of fat is also frequently wrongly assessed. For example, the consumption of butter, which contains only the fat and the vitamins A and D in the milk, is sometimes given as the milk equivalent, which gives a grossly false picture. To make a reasonably complete food, butter or cream would have to be reinforced with protein, calcium, phosphorus and vitamins B_1, B_2 and C. On the other hand, skim milk, which is commonly regarded as milk "with most of the goodness taken out", is still very good food and, reinforced with vitamins A and D, might be regarded as an excellent food. Naturally, skim milk is not as good as whole milk, especially in energy value, but of the two parts of the milk there can be no doubt that the skim milk is the more valuable.

The Care of Milk in the House

The value of milk can be lessened in two ways: (1) by the loss of chemical nutrients and (2) by souring or tainting as the result of bacterial growth. If the following rules are observed, these losses will be reduced to a minimum.

(1) As soon as the milk is delivered, place it in the coldest place in the house; the kitchen is the last place to keep milk in. If you have no refrigerator and the weather is very hot, you may be fortunate enough to be able to keep your milk in a neighbour's refrigerator. In America the domestic or communal refrigerator is an important feature of domestic catering. If using any of the earthenware-water coolers or any similar method depending on the cooling effect of the evaporation of water, place the container in the draughtiest spot you have.

(2) Always keep milk in the dark; sunlight can destroy or unstabilise all the vitamin C in a bottle of milk in half an hour.

(3) Leave the milk in the bottle until required; once the bottle is open, use the milk as soon as possible.

(4) As far as possible avoid transferring milk to jugs, etc. If this is necessary, clean the jugs as follows: thoroughly clean as usual, rinse in cold water, scald with boiling water and place upside down on a clean surface. Leave thus until required for use. If you leave milk in a jug, protect the milk by placing an inverted cup or basin, cleaned as above, over the jug. On no account wipe jugs with a cloth, which is, bacteriologically, frequently filthy.

(5) The hotter the weather, the more important it is to observe these precautions.

(6) If your milk is not pasteurised it can be made safe by heating to 160° F. and cooling to 60° F. just before use. It is better to avoid holding such "house-pasteurised" milk unless extreme care is taken to cool it quickly to below 60° F.

(7) Use as much of your milk as possible without heating it. For hot milk drinks heat it only to 160° F.

(8) When transferring the last portion of milk from the bottle, rinse out with a little water.

TABLE 2

FOOD CONSUMPTION IN THE UNITED KINGDOM

Consumption per Head per Week, 1909-13, 1924-28 *and* 1934-35.[4]

Item.	1909-13.	1924-28.	1934-35.	*Increase (+) or Decrease (−) of 1934-35 compared with*	
				1909-13.	1924-28.
	(*lb.*)	(*lb.*)	(*lb.*)	(*per cent.*)	(*per cent.*)
Meat (including poultry, etc.) ..	2·58	2·56	2·81	+9	+10
Cereals (including wheat and flour) ..	4·45	4·11	4·04	−9	−2
Potatoes	4·68	4·43	4·25	−9	−4
Other vegetables	1·38	1·81	2·22	+61	+23
Milk and cream	4·48*	4·34*	4·22	−6	−3
Condensed milk	0·05	0·14	0·23	+360	+64
Eggs in shell	0·27	0·33	0·41	+50	+24
Butter	0·30	0·31	0·49	+63	+58
Margarine	0·11	0·23	0·15	+36	−35
Cheese	0·14	0·18	0·19	+36	+6
Lard	0·08†	0·11†	0·18	−‡	−‡
Sugar	1·52	1·60	1·79	+18	+11
Fish	0·79	0·80	0·87	+10	+9
Fruit	1·19	1·75	2·23	+87	+27
Tea	0·12	0·17	0·18	+50	+6

* These estimates for milk may be somewhat too high.
† Lard made in the United Kingdom is included in meat.
‡ Not comparable.

These figures include wastage in distribution and in the home and consumption by domestic animals.

TABLE 3

ANALYSIS OF FAMILY EXPENDITURE BASED ON MOTTRAM'S DATA[6] FOR 32S. PER WEEK SPENT ON FOOD

Food.	*Per Cent. Expenditure on Food.*	*Actual Amount.* s.	d.
Milk	27	8	8
Meat	21	6	9
Vegetables and fruits	20	6	6
Cereals (including bread)	11	3	6
Butter	9	3	0
Sugar and jam	5	1	7
Eggs	2		7
Cheese	2		7
Miscellaneous	3		10
		32	0

Factors affecting the Composition and Nutritive Value of Milk

The milks of different mammals vary widely in composition, and the composition is related to the needs of the young mammal, particularly in respect of rate of growth and environment (Table 14).

The most important point here is the comparison of cow's milk with human milk. The outstanding differences are the higher casein, calcium and phosphorus contents of cow's milk. It is for this reason that some babies cannot digest cow's milk, as the curd formed in the stomach is much tougher than that formed by human milk, which forms practically no curd at all. The formation of this curd can be prevented by boiling the milk or by adding a weak alkali, or by selecting the milk of certain cows—the so-called "soft curd milk". Cow's milk can be approximately "humanised" by the following simple method: allow fresh milk to stand overnight in a cold place, pour off the top creamy half, dilute this to the original volume with water and add 1 oz. sugar per pint. The easy digestibility of milk, and especially of the fat, is largely due to the small size of the particles; the surface area of these particles in a quart of milk is a considerable fraction of an acre.

The compositions of bovine and human milk are shown in Table 15.[11]

There are appreciable differences due to breed, especially in fat (Table 16). Jersey and Guernsey milks are much richer in fat and therefore of higher nutritive value, especially for energy purposes. The yellow colour of the fat does not indicate a higher vitamin A content, however, as there is in such milks more yellow-red carotene but less preformed vitamin A, which is colourless.[9] The vitamin A of milk is obtained from the feed, and so in summer, when cows are able to feed on young grass rich in this vitamin, the milk is correspondingly richer.

The water-soluble vitamins B_1 and C are remarkably constant, but B_2 is somewhat higher in summer. It is probable that the B vitamins are formed by bacterial synthesis in the rumen.[9]

The chief factor affecting the solids-not-fat content is mastitis, or disease of the udder.[12, 13] Mastitis is one of the most important diseases of the cow economically,[14] and is frequently the cause of milk failing to reach the legal limit of 8·5 per cent.[15] A slight seasonal variation is also apparent.[16]

The Pasteurisation Controversy

Probably no subject outside religion and politics has been the cause of more prolonged and bitter controversies than the proposal compulsorily to pasteurise all milk. Certainly no subject has had more nonsense talked about it, usually by otherwise intelligent people with a smattering of scientific knowledge. It is a curious fact that while people will refrain from giving their opinions on such subjects as radiolocation, the theory of numbers, evolution and relativity, for the very good reason that they know next to nothing about these subjects, they will nevertheless most vehemently oppose the idea of pasteurising milk. Possibly there is some subconscious mystical feeling that milk coming from the mother's body is sacred, in much the same way as the cow and its milk are sacred to some races for religious reasons. Some people are fond of using the phrase "the biological property of milk", and refer to milk as a "living fluid". These high-flown phrases are unsupported by any scientific evidence. The value of milk is, as far as we know, the value of its constituents—fat, protein, minerals, vitamins, etc.—and no more. The only living things in milk are bacteria, some of which can cause death, and the body cells or leucocytes, which increase greatly when the udder becomes diseased. People who attach especial value to the "living milk" should therefore see that the milk they drink comes from diseased udders and is as highly contaminated with bacteria as possible. The conception that milk is a "living fluid" in any special sense is just sheer nonsense.

It is important that the intelligent consumer should know exactly what is meant by the pasteurisation of milk and that his information comes from unbiased sources. It is of interest to note that a recent survey or Gallup poll of farmers recorded a 99·9 per cent. vote against the proposal to pasteurise milk; a similar survey amongst housewives elicited the fact that 99·9 per cent. did not know what was meant by the heat treatment of milk.[17]

In seeking information and in listening to arguments we obviously should not pay too much attention to a gentleman who makes several thousands a year manufacturing pasteurising appliances, nor, on the other hand, should we take too seriously the protestations of those for whom the proposal may mean inconvenience, capital expenditure and possibly loss of trade. If we took away contracts from an engineer on the grounds that the bridges he built were unsound and might collapse with loss of life, we should expect a moan, but could hardly be expected to renew contracts on compassionate grounds. We should obviously say: "Build safe bridges and we will give you the contracts".

Before listening to anyone's opinion on the subject, therefore, we should ask: "What is the *real* reason why you are for or against the proposal, and what do you know about the subject?" It is suggested that no one without a working knowledge of biochemistry, bacteriology and the dairy industry on both the productive and distributive sides should venture to give his opinion on this highly technical subject. In a matter which concerns the well-being of the nation as a whole we obviously cannot be swayed by the vested interests of certain sections of the community.

The term "pasteurisation" is coined from the name of Pasteur, who in 1860-64 showed that unwanted fermentation in wine could be prevented by raising the temperature to from 122° to 140° F. for a short time.

The method was soon afterwards applied to milk and was slowly developed in the larger towns of America and Europe for the purpose of improving keeping quality. The fact that pasteurisation destroyed pathogenic organisms, and so rendered milk safe, was in the early days a secondary consideration. Medical bacteriologists were naturally more interested in the public health aspects of pasteurisation than in its commercial advantages, but it is not surprising that a process which is simple and cheap to apply and achieves such outstanding effects should have increased steadily in popularity and usefulness.

In considering the history of the pasteurisation controversy it is important to remember that, although scientists everywhere agreed fairly closely on the necessary degree of heat treatment, the process was for long very loosely controlled in commercial practice. Milk was frequently either overheated or underheated, so that it either gave a cooked flavour or was found to contain viable T.B. In addition, properly pasteurised milk was and still is frequently badly contaminated by unsterile plant, so that its keeping quality was not appreciably improved and on occasions was actually decreased.

Temperature-time Conditions

Providence has been very favourable to us in the matter of viability of pathogenic organisms and the chemical and physical make-up of milk. Fortunately, all common pathogenic organisms likely to occur in milk are killed by relatively mild heat treatment. The most resistant organism is the tubercle bacillus, and bacteriologists agree that normally it is killed by heating milk for 10 minutes at 140° F.—a temperature at which we can sip tea with pleasure.

TABLE 3

PER CENT. CONTRIBUTION OF 1 PINT MILK TO DIET OF ADULT AND 5-YEAR-OLD CHILD

(After Kon.[8]*)*

	For Moderately Active Man.	*For 5-Year Old Child.*
Calcium	88	70
Riboflavin	33	75
Protein	28	38
Vitamin A	17	33
Vitamin B_1	15	31
Calories	14	25
Vitamin C	16	23
Nicotinic acid*	3 to 14	6 to 32
Vitamin D	3	3
Iron	2	3

* Methods of estimation are at present uncertain.

Bovine T.B. is also by far the most dangerous pathogenic bacterium in milk, and is considered to account annually for about 2,000 deaths, mostly of non-pulmonary T.B. in children.[11] We can, then, regard T.B. as the index organism for pasteurisation—any heat treatment which destroys T.B. can be relied upon to destroy all other pathogens in milk. It is also extremely fortunate that none of the pathogens of importance in milk form spores. If only one of these produced spores, even boiling for several hours could not be relied upon to kill the spores and make the milk safe. We should have to autoclave all milk in order to make it safe—a process which turns milk slightly brown and markedly affects the flavour. Happily this

(Continued on page 248)

TABLE 4

DIETARY NEEDS OF VARIOUS INDIVIDUALS

(After National Research Council, U.S.A.[9]*)*

	Calories.	*Protein.* (*g.*)	*Calcium.* (*g.*)	*Iron.* (*mg.*)	*Vitamin A.* (*i.u.*)	*Vitamin* B_1. (*mg.*)	*Riboflavin.* (*mg.*)	*Vitamin C.* (*mg.*)
Man (11 stone):								
Sedentary	2,500	70	0·8	12	5,000	1·5	2·2	75
Moderately active ..	3,000	70	0·8	12	5,000	1·8	2·7	75
Very active	4,500	70	0·8	12	5,000	2·3	3·3	75
Woman (9 stone):								
Sedentary	2,100	60	0·8	12	5,000	1·2	1·8	70
Moderately active ..	2,500	60	0·8	12	5,000	1·5	2·2	70
Very active	3,000	60	0·8	12	5,000	1·8	2·7	70
Pregnancy (latter half)	2,500	85	1·5	15	6,000	1·8	2·5	100
Lactation	3,000	100	2·0	15	8,000	2·3	3·0	150
Children:								
Under 1 year	45/lb.	1·6/lb.	1·0	6	1,500	0·4	0·6	30
2 years	1,200	40	1·0	7	2,000	0·6	0·9	35
5 ,, ...	1,600	50	1·0	8	2,500	0·8	1·2	50
8 ,, ...	2,000	60	1·0	10	3,500	1·0	1·5	60
11 ,, ...	2,500	70	1·0	12	4,500	1·2	1·8	75
Girls:								
14 years	2,800	80	1·3	15	5,000	1·4	2·0	80
18 ,, ...	2,400	75	1·0	15	5,000	1·2	1·8	80
Boys:								
14 years	3,200	85	1·4	15	5,000	1·6	2·4	90
18 ,, ...	3,800	100	1·4	15	6,000	2·0	3·0	100

1 mg. vitamin B_1 = 333 i.u. 1 mg. vitamin C = 20 i.u.

Two Volumes *De Luxe*

If you have a use for a collection of reproductions of posters and other propaganda material used to stimulate workers' efforts in war production, this volume* may conceivably be worth five guineas to you. The collection has been made with enormous thoroughness but less discrimination. There are examples not only of posters, but of factory wall sheets, bulletin boards, photographic display, pay envelope "stuffers," scripts of speeches of Service visitors to works, recorded talks, exhibitions, film sequences, works magazines, murals, etc.

The book has pretensions to be more than a picture book. The author's enthusiasm for propaganda addressed to employees leads him to present it as a sort of new gospel for removing all industrial troubles and for persuading recalcitrant Labour into co-operation with benevolent Management.

Mr. Shaw's philosophy of employer-employee relationships is uncomplicated and begs all the questions. You get the impression from his book that all the political philosophies of the ages, all the grievances and ineptitudes which precipitate trouble in the factory can be brushed aside, and that all that is needed for industrial harmony is that Management shall slap a few exhortatory posters on the wall.

Nowhere in the book is there any sign that the author realises that, if the barrage of war-time propaganda has created an emotional atmosphere in which the individual could be spurred to work harder, the necessary conditions of a collective social aim and a common national danger will be absent in peace-time.

A final criticism is of the misleading title of the book. There is nothing in the book which bears on the subject normally understood as industrial publicity—that is, the use of publicity to promote the sales of industrial products.

Trade with America

Take a condensed version of a commercial gazetteer originally published as a "Market Guide" for business men; add another reprint—this time coloured—of statistical charts of economic information for years up to 1942; stiffen with a useful directory of American Government institutions and their officials; decorate with some maps taken from a 15 cents Government publication; spice with general feature-agency articles on aspects of American political, social and economic life which skim swiftly over the bright synthetic surface of the American scene in the safe, uncritical manner of the authority who writes for books of reference; and, finally, extend or distend the mixture with a mass of articles and tables borrowed from periodicals. The result is a handsome and quite useful conglomeration† in which you may find the one fact about America which you happen to want at the moment. The publishers have, however, neglected to aid your search by providing an index.

If the book fulfilled the promise of the publishers that "with its help the British industrialist should be able to lay down his plans for post-war trade with America with a considerable amount of confidence in their successful outcome," he would pay his five guineas without complaint that the greater part of the compilation is borrowed material. We have, however, failed to find between its covers any information about the pre-war tariffs of the U.S.A.—not to speak of any forecast of its post-war tariffs.

A. E. B.

* *Industrial Publicity*. By C. K. Shaw. 1944. London. Pp. 438+viii. £5 5s.

† *Overseas Reference Book of the United States of America*. Compiled and edited by Cecil Brooks. 1944. London and New York. Pp. 390. £5 5s.

Empire Research

The Imperial Institute has no need to be ashamed of last year's record* of technical investigation and advice. By the standard of the Empire, its resources and the needs of its peoples the work is, of course, modest; but in relation to the resources available in war-time the list of achievements is creditable.

Among the materials investigated by the Plant and Animal Products Department were the following: Cyprus pyrethrum flowers, St. Lucia and Belgian Congo derris root, French West African cinchona bark, *Ocimum kilimandscharicum* oil from the Sudan and Kenya *Helichrysum hochstetteri* oil. Reports on these materials have been published in the *Bulletin* of the Institute. During the year 176 samples were reported on, states the annual report, 1943, just issued.

Under the heading of "Intelligence" the Institute reported on the feasibility of developing production of papain in the West Indies; advised that use of cashew nut shell oil as an insecticide was of limited scope; helped a Gold Coast chemical manufacturer to explore the possibility of producing soap and glycerin; and enquired into the bleaching of palm oil for use in soap manufacture, the detoxification of lupin seed for stock feeding, the production of lavender oil in Tanganyika, the extraction of sesame seed oil and the marketing of pyrethrum.

The record of the Institute's work is so sound and impressive that it is a pity that so much space in a short report of 46 pages is given up to trivial services. It is of no conceivable interest to anybody but the editor of a particular publication that the Institute criticised a leaflet he prepared and lent him a reproduction of the Burmese flag. We have no doubt that the exhibit of dairy products in the Australian Court of the Exhibition *is* "improved by the addition of sample tins of various brands of condensed milk"; and we are ready to believe that the ladies who have voluntarily helped the supervisory staff have indeed "carried out their duties with great efficiency coupled with both tact and discretion." But the atmosphere of the parish sewing circle created by the unfortunate tone of self-satisfaction in which some of this report is written—notably the chapter on the Exhibition Galleries—is precisely the atmosphere which must not be allowed to smother the Imperial idea. The value of the record of concrete technical achievements of the Institute is minimised by this padding.

A. E. B.

* *Imperial Institute: Annual Report*, 1943. By the Director, Sir Harry Lindsay, K.C.I.E., C.B.E., to the Board of Governors. Pp. 62+iv.

War-time Transport

H. AUTY.

THE DIFFICULTIES of transport are very real. They are a source of constant worry to already harassed factory managers. Raw materials fail to arrive when they are wanted or reach the factory all in a heap. Manufactured goods continue to occupy valuable storage space because there is a shortage of despatch transport. There is a constant and increasing pilferage and damage to goods in transit.

These troubles, and many more, are also shared by the transport and distribution manager, who cannot now regulate the inflow and despatch in a satisfactory manner. In some instances, such as with butter, cheese and condensed milk, a large proportion of the bulk movement is controlled by the Ministry of Food. Where road transport is decided upon the control is passed over to the Ministry of War Transport, Road Haulage Organisation, who employ whatever controlled lorries are available. Similar arrangements obtain in regard to many incoming raw materials.

Even with his own particular traffic, the food transport manager must be governed by the many restrictions and regulations in operation.

In consequence of these conflicting controls, the work of transport is more complicated. The task of attempting to satisfy factory and consumer requirements becomes unbalanced. Results are often of the same order.

Officials and the Trade

There is, however, a good spirit of understanding between Ministry officials and the trade. Both seem to be doing their best to overcome the natural difficulties of the present system. A trader should then, in his own interests, take full advantage of the assistance which can be given by local officers.

The Assistant Divisional Food Officer (Transport) should be consulted particularly in regard to a shortage of rail trucks and road transport. As also in the allocation of traffic between road and rail. At such factories where facilities exist for both rail and road transport, too much strain may be placed upon one or the other despatch section; simply because the Ministry have arranged for all their traffic to go forward either by road or rail. This may lead to serious congestion unless prompt action is taken with the A.D.F.O.(T).

Assistance from the above should also be sought in such cases where M.O.W.T. Unit Controllers decline to accept urgent foodstuffs, machinery, etc., for conveyance by road.

The Area Distribution and Warehousing Officers of the M.O.F. can also be helpful in placing bulk stocks in centres convenient for subsequent distribution to the wholesale and retail trade.

A list of the Ministry of Food personnel responsible for transport and warehousing, reference X/TR/223, will be supplied upon application to the Ministry of Food.

Since the establishment of the Government Road Organisation, all Government traffic is controlled regardless of mileage. That is, the M.O.F. and other Government Departments make their own transport arrangements and pay their own carriage charges. Where road transport is decided upon the work is allocated to vehicles controlled by the above organisation.

Control also extends to ordinary commercial traffic for movement by road for distances of 60 or more miles. Although this control has been effective a number of months, the Minister of War Transport has apparently found it necessary, under the new Defence Regulation 73B, to issue the Road Transport of Goods Order, 1944.

This Order provides that on and after May 22 nearly all long-distance movements of general traffic by road will be arranged through the Government Road Haulage Organisation. The only classes of commercial traffic at present excluded from control are:

General Goods for distances of less than 60 road miles.
Parcels and Smalls.
Liquids in Bulk conveyed in tank vehicles.
Abnormal Indivisible Loads.
Removals of household furniture and effects.

Certain exemptions may also be given by the Regional Transport Commissioners by means of permits covering an individual consignment or class of consignments, or, in the case of individual consignments, by officers of the Road Haulage Organisation. Any operator desiring a permit for a class of consignments should apply to the appropriate district transport officer without delay.

In the case of " C " operators, permits will normally be limited to the carriage of their own goods only, and as a condition of the permit they may be required to place the vehicle at the disposal of the Road Haulage Organisation for loading on return journeys.

Liquids in containers, such as edible oil in barrels or drums, are considered to be " General Goods " for the purpose of control.

Parcels and smalls are defined as " any consignment of goods which is under one ton in gross weight and is sorted from other consignments at a traffic bank after collection and again before delivery, provided that all goods collected on the same day from the same consignor at the same point of collection for the same point of delivery shall be treated as one consignment."

It should also be made clear that, although household removals are excluded from control, same may not be sent by road 60 or more miles without permission from the Regional Transport Commissioner.

The main feature so far as it affects ordinary commercial traffic is, except at the ports mentioned below, that controlled traffic for movement 60 or more miles, unless subject to exemption permit, must be offered to the appropriate Unit Controller—that is, the Controller responsible for the Unit at the place of collection.

At the ports of Avonmouth and Bristol, Cardiff, Glasgow, Liverpool, including Birkenhead, Manchester, Newport and Swansea, the acceptance of controlled traffic ex ship or transhipshed or warehouse within the dock area, is dealt with by the Area Road Haulage Officer and not the Unit Controller.

M.O.W.T. Conditions of Carriage

All traffic carried by the Road Haulage Organisation will be accepted under M.O.W.T. Conditions of Carriage. Similar conditions will apply to food and other general goods accepted for carriage by controlled haulage undertakings for distances less than 60 miles, and also for parcels and "smalls" accepted by them.

This arrangement, to accept both controlled and non-controlled traffic under the Minister's Conditions of Carriage, is no doubt intended to simplify the work and also protect the interests of the haulage contractor. Indeed, many hauliers, irrespective of whether they are controlled undertakings, have adopted these conditions. It therefore follows that senders of goods by road should satisfy themselves as to what conditions apply with each haulier.

Under normal circumstances the "Goods in Transit" insurance policies should be periodically examined. Apart from taking note of the maximum amount for which each load is insured, the exemption clauses should be studied. In the event of insufficient cover—a fairly common pre-war feature—or other unsatisfactory conditions, the carrier should be asked to have them amended.

In particular, senders of liquid foods should look for a clause exempting the insurance company from liability for loss occasioned by or due to leakage or spilling. This may be corrected by the addition of the following: " . . . except when caused by accident to the vehicle."

Copies of W.O.W.T. Conditions of Carriage may be obtained from any office of the Road Haulage Organisation. These conditions do not apply to abnormal loads or removals of household furniture and effects.

All consignments of controlled traffic will be covered by the Minister's delivery, consignment and receipt notes (Forms RH/M/2B, C and A). The organisation cannot accept consignors' individual documents nor arrange to obtain or give receipts for goods other than on these documents.

Claims

Claims in respect of loss of or damage to goods must be made on the carrier whose name is shown on the relative consignment note. Notice of any loss or damage must be given *in writing* within four days of delivery, or in the case of non-delivery within fourteen days of the time when the goods should have been delivered.

If, however, the goods were carried in a vehicle belonging to a Government Department, or one of the Services, the claim should be sent to the Ministry of War Transport, Road Haulage Organisation, Berkeley Square House, London, W. 1.

The carriers' liability under these conditions is limited to £200 per gross ton of the goods lost, damaged or affected, except where the weight of the consignment does not exceed one gross cwt., in which case the liability will not exceed £10 per consignment.

It will be seen from the above that, contrary to railway conditions, no definite time limit is laid down for presentation of actual claims. It is, however, understood that after receiving notice of loss, damage or non-delivery, the carrier supplies claims form RH/A21, which has to be completed and returned by the consignor without undue delay.

Milk and the Consumer

(*Continued from page 245*)

is quite unnecessary. Complete safety can be assured by heating milk to 145° F. (62·8° C.) for 30 minutes—a treatment which has only a very slight effect on vitamins B_1 and C, and a negligible effect on cream line, palatability and denaturation of the albumen. These last three properties are the first to be affected if the heat treatment is too drastic. The time-temperature conditions necessary to destroy the different disease-producing bacteria and to affect other properties of the milk are shown in Figs. 1 and 2.

We may define pasteurisation in general terms as "any heat treatment which secures the certain destruction of unwanted micro-organisms without impairing the commercial value of the product".

The pasteurisation of milk is, of course, a special type of pasteurisation, and we may define this for consumer milk as "any heat treatment of milk which secures the certain destruction of T.B. without markedly affecting the flavour or the cream line". If the milk is to be used for another purpose, the definition may have to be altered. Thus for cheese-making we may define pasteurisation as "any heat treatment which secures the certain destruction of any micro-organisms likely to cause faults in the cheese (*e.g.*, holes or taint by coliform organisms) without markedly affecting the formation and character of the rennet curd or otherwise producing undesirable features in the mature cheese".[18] Pasteurisation usually destroys about 99 per cent. of the bacteria in bulk milk. The milk of certain producers who do not properly clean and only "half sterilise" their milking machines and utensils may be rich in thermoduric organisms. Pasteurisation may kill only a half or, in some cases, a very small proportion of the total flora of such milk. Fortunately, the organisms surviving pasteurisation are non-pathogenic and have little effect on the keeping quality of milk. When pasteurised milk sours or deteriorates rapidly it is almost invariably due to post-pasteurisation contamination.

(*To be continued*)

NOTE.—The rest of the Tables and Figures mentioned in the text will be published in succeeding parts.

Two Grams of Synthetic Sugar

THE chemistry of the formation of sucrose in plants has received the attention of research chemists for a long time past.

The University of California (states Reuter's Trade Service) has announced that three of its members have evolved a method whereby they have produced more than two grams of pure crystalline sucrose.

It is recognised that the high cost of production of synthetic sugar by the method discovered will preclude the possibility of its immediate utilisation commercially, but from the account given it would appear that another step has been taken in the chemistry of sugar formation.

Compressed Dehydrated Foods

Hotfoot upon large-scale dehydrated food has followed its compression, which shows still greater economies in cargo space, labour in transportation, packaging material. This article, written by an American author, sketches the start of the dehydrated egg business and gives some interesting figures illustrating the advantages of certain compressed dehydrated foods.

ALBERT GRAY

THIRTY to forty times the iron and steel needed for the erection and equipment of dehydration plants will be tied up in shipping facilities if overseas shipments are made up of fresh foods, affirmed engineers at the inception of hostilities and Lease-Lend cargoes. One ton of metal devoted to dehydration saves 250 tons in shipping bottoms.

A 50,000 ton transatlantic shipment of dried eggs effects a saving over a corresponding shipment of fresh shell eggs of $2,310,000 in ocean freight charges, $39,300 in storage, $42,500 in inland freight charges, $13,300 in labour, and $348,000 in containers—a total of $2,753,100.

At the outset of food shipments from the United States Roy Hendrickson, of the Department of Agriculture in that country, one day scrambled up from the hold of a vessel, where he was seeking a solution to the appalling losses incurred from breakage in overseas eggs shipments.

" The stevedores are romping over those eggs down there as if the crates were filled with cement. The British tell me they get worse treatment on the other side, where green hands unload the ships in the dark, sometimes in a shower of bombs. We've got to get an answer to it."

The Battle of the Atlantic meant increasing demands for cargo space; submarine menace; consequent losses in convoys; decreasing tonnage; shipping space shortages. Transportation facilities were inadequate for food shipments, hence food shipments must perforce, like Mahomet, " go to the mountain ".

Problem of Space Solved

Three dozen eggs were reduced by dehydration to a pound of egg powder. A case of thirty dozen shell eggs weighs 45 to 58 lbs. and fills 2 cubic feet of space. These eggs dehydrated weigh a little less than 10 lbs. and fill ⅓ cubic foot of cargo space. Cabbage weighing, prepared for canning, 1,450 lbs., and 2,400 lbs. canned and packed, weighs, dehydrated and packed, 215 lbs. Lima beans, canned and packed, weighing 2,300 lbs., when dehydrated saved approximately 89 per cent of that weight; 1,100 lbs. of fresh tomatoes dehydrated and packed weigh 125 lbs.

In 1941 the cargo space problem was solved. Then in 1942 came increased demands for food; in 1943 still greater demands. " She's never as happy as she is going to be " is the line of the poet. Cargo space, satisfied for 1941, again became a problem. More food must be shipped in even less cargo space.

About eight years ago scientists began experimenting with the compression of foods. The first attempts were made with flour. Then experiments were made in compressing coffee. First, the roasted beans were frozen, then squeezed into little cakes under a pressure of 1,500 to 2,000 lbs. to the square inch. The result was almost double the cups per pound of coffee.

Where dehydration had reduced the shipping foodweight from 70 per cent to 90 per cent., compression—following the dehydration process—gained a further reduction in bulk from 30 per cent. for dried whole milk to 80 per cent. for powdered soups. This reduction by compression for dehydrated beef is 65 per cent., for dehydrated potatoes 75 per cent., together with the further saving of warehouse charges, freight, fuel and labour.

The dehydration of eggs reduces weight to approximately one-sixth that of shell eggs. When these dehydrated eggs are compressed into little 1-lb. blocks, storage space is cut by half. A pound briquet of dried compressed eggs contains a trifle more than three dozen eggs. One dozen eggs thus processed would fit into the space of one shell egg.

Avoiding Oxidation

Under the tremendous weight used in compression, air is literally squeezed from the food material, and the minute food particles in the compressed briquets are thus protected from exposure to the oxygen infiltrated into the food mass from the atmosphere. A quantity of dehydrated eggs, compressed and wrapped in cellophane four years ago and kept without refrigeration, were recently found in good condition.

The removal of water by dehydration reduces space from 50 per cent. to 90 per cent., varying with the moisture content of the food. Ten tons of food thus processed are reduced to 1 ton. Water thus removed, air still remains. The compression process applied to dehydrated foods then reduces the bulk another 35 per cent. to 75 per cent.—an answer to the eternal quest of the human race for something better. In some instances 2½ cubic feet of cargo space suffices for the shipment of food supplies that unprocessed would fill 100 cubic feet.

From the compression of dehydrated egg powder the space saving is 50 per cent.; of dried soups 35 per cent.; of coffee 42 per cent.; of beef 65 per cent.; of beets 65 per cent.; carrots 55 per cent.; onions 65 per cent., and potatoes 75 per cent.; dried whole milk 30 per cent., and dried chocolate pudding 47 per cent.

Wrapping Compressed Foods

The wrapping of these tiny packages of compressed dehydrated foods is by machines used in packaging cigarettes, with slight modifications. These blocks of food, taken from the machines in which they are compressed under pressure of 250 to 2,500 lbs. to the square inch, are transferred to wrapping machines. There the briquets are encased in cellophane by machines keeping

pace with the compressing apparatus, turning out these food cakes at a rate of 120 to 170 a minute. A hot sealing iron is applied to the cellophane film wrapper, and the package, thus airtight sealed, becomes immune to moisture, grease, dust or germs.

The Rôle of Temperature

The efforts of scientists have been directed not only to reducing both bulk and weight, but in maintaining the nutritive values of these processed foods. Research disclosed that the compression process achieves the most satisfactory results with the temperature of the foods, during the process, reduced to a varying low of 20° above to 20° below zero Fahrenheit, particularly in instances where the breaking down of fat globules is to be avoided and vitamin values retained.

On the other hand, better results in some instances are secured by increasing food temperatures in the compression process. In the processing of coffee the product is frozen, then subjected to pressures varying from 1,500 to 2,500 lbs. per square inch. By this method the volatile oils do not escape and most of the flavour is retained.

Apple nuggets, on the other hand, with a 2 per cent. moisture content after dehydration, require only 450 lbs. per square inch pressure to produce a density of 64 lbs. per cubic foot at a temperature of 170° F., whereas at a temperature of 75° F. and a pressure of 850 lbs. per square inch—almost twice as great—they will attain a density in the compressed product of only 55 lbs. per cubic foot.

In the treatment of dehydrated beef cubes, with a moisture content of 4·1 per cent., the temperature is maintained at 160° F., and the product, compressed under a pressure of 659 lbs. to the square inch, produces a 62-lb. per cubic foot density, with a reduction in volume of 57 per cent.

With beet slices, a 5·7 per cent. moisture content, compression is at a temperature of 120° F. under 650 lbs. to the square inch, producing 64-lb. density and an 80 per cent. saving in bulk over the dehydrated product. In the preparation of whole prunes, with a 28 per cent. moisture content, the best results are with a temperature of 75° F. and 150 lbs. pressure.

A shoe-box filled with compressed dehydrated potatoes is sufficient for serving a hundred men. Dehydration reduces the bulk and weight of potatoes 85 per cent. With the compression of the dried product the potatoes shrink in size and weight another 75 per cent., making a total reduction in the original tuber, filled with water, of 96 per cent.

Economy in Containers

In the estimated savings in a 50,000-ton cargo of compressed dried egg powder occurs an item of $248,000 for containers, required in fresh food cargoes. In the computation of the costs of these processes over the transportation of fresh food this saving alone of container expense offsets the cost of dehydration and compression processes. Consequently, taking into consideration the normal market price of tin containers, the cost in the preparation of dehydrated and processed foods is no greater than with fresh, while the saving in storage, transportation, labour and refrigeration leaves a credit balance in favour of compressed over fresh foods.

Into the preparation of these foods has lately been introduced a new technique that suggests an even greater revolution in food processing. In the drying of foods by dehydration the outside surface of the product is subjected to the greater heat, hence foodstuffs so treated are not subjected throughout to a uniform temperature. Even with the shredded product the heat still has a more intense application on the surface of the product. By the application of electronic heat to the compressed brick it is possible to reduce the moisture content of the processed food to a bare 1 per cent., thus removing to a still greater distance the remote possibility of spoilage.

Fluorescence Analysis

(*Continued from page* 240)

[281] F. Wokes, *Analyst*, 1942, **67**, 135 (Thiochrome method. Precautions required).

[282] F. H. Cohen, *Arch. neerland. physiol.*, 1935, **20**, 167 (Fluorimeter).

[283] G. C. Supplee *et al.*, *J. Dairy Sci.*, 1936, **19**, No. 3, 215 (Fluorimeter).

[284] S. M. Weisberg and I. Levin, *Ind. Eng. Chem. Anal.*, 1937, **9**, 523 (Simple fluorimeter).

[285] L. E. Booker, *J. Biol. Chem.*, 1933, **102**, 39 (Purification of riboflavin for assay).

[286] A. Seidall, *ibid.*, 1933, **100**, 195 (Purification of riboflavin for assay).

[287] Supplee *et al.*, *ibid.*, 1935, **110**, 365 (Purification of riboflavin for assay).

[288] Supplee *et al.*, *J. Dairy Sci.*, 1936, **19**, 215 (Purification of riboflavin for assay).

[289] B. Bisbey and H. C. Sherman, *J. Biol. Chem.*, 1935, **112**, 415 (Purification of riboflavin for assay).

[290] Itter *et al.*, *ibid.*, 1935, **108**, 579 (Purification of riboflavin for assay).

[291] G. N. Murphy, *Indian J. Med. Res.*, 1937, **24**, 1083 (Assay of B_2 by fluorescence).

[292] D. B. Hand and P. F. Sharp, *J. Dairy Sci.*, 1939, **22**, 779 (Riboflavin content of cow milk).

[293] C. H. Whitnan *et al.*, *J. Amer. Chem. Soc.*, 1937, **59**, 1153 (Vitamin B_2 in milk).

[294] Supplee *et al.*, *J. Biol. Chem.*, 1936, **113**, 787 (Riboflavin in " vitamin-free " diet).

[295] M. Deribere, *Bull. Assoc. Chim.*, 1939, **56**, 39 (Flavins in milk, wine, etc.).

[296] M. Deribere, *ibid.*, 1939, **56**, 515 (Precautions in flavin assay).

[297] A. D. Emmett *et al.*, *Ind. Eng. Chem. Anal. Ed.*, 1941, **13**, 219 (Assay).

[298] A. Hodson and L. C. Norris, *J. Biol. Chem.*, 1939, **131**, 621 (Comparison of methods).

[299] M. Swaminathan, *Ind. J. Med. Res.*, 1942, **30**, 23 (Riboflavin).

[300] M. Swaminathan, *Ind. Med. Gaz.*, 1942, No. 11, 650 (Riboflavin assay).

[301] V. A. Tajjar, *J. Biol. Chem.*, 1941, **141**, 355 (Riboflavin assay in urine).

[302] O. Warburg and W. Christian, *Biochem. Zeit.*, 1933, **266**, 377 (Riboflavin detd. as lumiflavin).

[304] R. Kuhn, T. Wagner-Jauregg and H. Kaltschmitt, *Ber.*, 1934, **67**, 1452 (Riboflavin detd. as lumiflavin).

[305] H. E. C. Wilson and G. K. Roy, *Indian J. Med. Res.*, 1938, **25**, 879 (Riboflavin detd. as lumiflavin).

[306] G. E. Shaw, *Quart. J. Pharmacy and Pharm.*, 1939, **12**, 541 (Riboflavin detd. as lumiflavin).

[307] R. S. Morgan and K. MacLennan, *Biochem. J.*, 1928, **22**, 1514 (Fats).

The Canning of Hams

A plain, unvarnished account of the process of ham canning as carried out pre-war in a Paris factory. The author went there as a novice to learn the business from A to Z and describes his experiences without circumlocution.

ANDREW K. BAIRNSFATHER

LEGS of pork on arrival at the factory are checked in one at a time to see they are not bruised or cut wrongly.

They are then weighed, after which they go down a shoot to the basement, where they are trimmed. Each man in trimming gang does 40 to 50 legs per hour. To trim a leg of pork for a ham there are four cuts with the knife:

1. A straight line just penetrating the rind on the thick fat on side farthest from aitch-bone.
2. Cut off the piece.
3. Turn shank nearest to you and cut in circle with one stroke from end of straight line right round to the other end.
4. Remove flesh from aitch-bone.

The above job is carried out best by using a pliable knife, and proves to be simple after practice.

After the legs have been trimmed, the blood is removed. This is done by picking up the leg in both hands, shank down, and striking down sharply on the table so that the shank bends at the joint. The leg is placed rind down on the table and pressed with both thumbs from joint, letting the hands slide slowly to vein exits near aitch-bone, making sure to wipe blood away first. The legs are then put in their weight class, which goes as follows:

No. 1	...	...	up to 4 kilos
,, 2	...	...	4 ,, 6 ,,
,, 3	...	...	6 ,, 7½ ,,
,, 4	...	...	7½ and over

Brining Pork Legs

The process so far has all taken place in the Trimming Department. The legs now go on their journey. First they are rubbed thoroughly in coarse salt and left in the Cold Room for one night. Next they go to the Brining Department, which needs special mention. Brine mixture is always made in advance of actual use. There are one or two points which should be made clear. Firstly, the reason for rubbing the legs in salt is that by so doing no loss of extractives is suffered; secondly, by allowing them to stand in the Cold Room, with the fan on, they are cooled down to 1½° to 2½° C., which is also the temperature of the brine mixture. Four or five barrels full of new brine standing on small trucks are always ready so that they can be moved to whatever tank is being worked on.

The legs are packed in clean, dry tanks of square shape about 5 feet high. Each side is filled with legs arranged with shanks towards the centre. It is possible to get seven a side and six in the centre, making twenty legs in each layer. Packing is carried on until the tank is full, and about 3 inches from the top a rack is placed and fixed securely by blocks of wood on each side. The brine mixture is then poured in until the rack is well covered.

The legs are left in the brine for fifteen days, after which the brine is pumped out into barrels. The top half of the legs in the tank are dropped on the floor of the chamber on one side, the lower half on the other. To repack the tank the top half goes in first, which means that the lower half will then be at the top. The rack is fastened down as before, and after the brine has been made up to strength by the addition of salt it is poured into the tank.

After another fifteen days the above-described process is repeated, but this time the legs must be "sounded" to make sure that they are free from taint or even slight sourness.

The method of sounding is as follows: A beef shin-bone, cut at the end to a sharp point, is pushed into the leg at the joint where there is the most possibility of taint. The point is smelt as soon as it is withdrawn. The smell of an affected leg is unmistakable.

After being packed in the tank for the third time the legs are left till the following periods expire:

No.	*Weight up to Kilos.*	*Days in Brine.*
1	4	35
2	6	40–41
3	7½	45
4	over 7½	52

When the hams have been cured they are left one night in clean cold water, then loops tied on to them. They are scraped and thoroughly washed in lukewarm water, which is changed often and kept clean. They are then sounded once more and graded for quality. Of the two distinct packs which were made, the finer quality was smoked. The second quality was dried only.

Drying and Smoking

Up to now all work has been performed in the basement; now the overhead railway runs into the hoist, where the hams go for drying and smoking. The drying process comes first. The heat is derived from steam pipes and controlled at 35° C. for 12 hours. The second-quality hams are left in the Cold Room for 24 hours.

After the first-quality hams are dried they are smoked for 8 hours at 32° C. The smoke is not direct, but enters the chamber by means of flues, built all round it, by which means a uniform colour is obtained. The reason for such a short smoking is to avoid too deep a colour of the rind and also to avoid undue loss of weight.

The hams, now ready for the Canning Department, go to the boning benches. Each man bones twenty hams per hour, and is not allowed to do more, as it is considered that faster speeds would mean the inside of the ham having too many knife cuts. Good boners can do about 30 hams an hour, using the gouge, but twenty per hour is the strict rule for an 8-hour day. Control is exercised by the boner keeping the " spoon-bone " from the shank from each ham boned. At the end of the day the foreman checks his count to see that the man has done his job.

During the whole process data relating to brine gains, boning loss, drying loss, smoking loss, etc., are collated.

Pressing the Hams

When boned the knuckle is pushed into the ham and the rind cut to form a half-circle flap, which is sewn down, using five stitches. The face of the ham is trimmed and made ready for the press, this being done by pulling the lean part back upon the face of the ham and cutting off a straight piece of fat and rind. The ham is now turned over, rind up, the point of the knife slipped between the rind and fat about ½ inch and the point run across to the other side. The piece of rind is removed and the fat cut on the slant, holding the ham sideways. The face of the ham has now the following appearance: the lean jutting out a little back, ½ inch of the fat, then the rind ½ inch back. If all goes well the result is that on coming out of the press the face of the ham is perfect and its appearance not marred by the sight of the rind hanging over.

After the final trimming the gap made by the removal of bones from the ham is drawn together by two crosswise stitches. The ham is then weighed and placed in its respective stack ready for pressing. The presses are operated by compressed air and each one has two moulds—while one leg is being pressed the operator fills the other mould, then moves the plunger from one to the other, and so on. The ham is placed in the press rind up, and its face is flush with the smooth side of the mould, the knuckle being forced a little lower down.

The Canning Process

The tins to contain the hams are made shallower at the knuckle end; this gives an almost glove-like fit, which is important, as it has a great deal to do with the final cooking loss. After coming from the press the lids are placed on the tins, which are then conveyed to the different seaming machines, all set for tins of various sizes.

In the particular factory being described there were eighteen different tin sizes.

Tins are soldered by hand, each solderer using his own mark on the tin, so that in the event of it not coming through the vacuum properly or developing a leak after a short time in the warehouse the operative responsible can be identified. After being vacuumed the tins are all put in separate stacks, each one having a number stamped on it.

The tinned hams are now ready for cooking in water in open tanks. They are stacked on a container having four shelves. In the event of a mixed batch of hams being cooked at once, the large tins occupy the bottom shelf and the small ones the top shelf, so that when the latter are cooked the container can be raised out of the water just enough to allow for their removal. This avoids interruption of the cooking of the larger sizes. Tanks are loaded and unloaded by means of a travelling overhead hoist.

As regards actual cooking, different manufacturers have slight modifications. Obviously there is no hard and fast rule in this matter, and some subtle difference in procedure may improve the pack, but this is a matter for trial under actual manufacturing conditions. The following is one method:

THE COOKING OF TINNED HAMS

Weight (Kilos).	*Time.*	*Temperature.*
8·70	5 hrs. 20 mins.	90° C.
7·95	4 ,, 15 ,,	
6·65	3 ,, 45 ,,	
6·35	3 ,, 35 ,,	
5·10	2 ,, 50 ,,	
4·50	2 ,, 30 ,,	

The cooking time is calculated from the arrival of the water to the desired temperature. During this operation the tins are placed lids up because, as the ham enters the tin rind down, when cooked with lid up the jelly sinks and the fat rises.

On being taken out of the cooking tanks the tins are passed through a cold spray and left to set in the Cold Room for one night.

The usual loss met with is:

Ham taken from tin ...	15-17 per cent.
Without rind	23-25 ,, ,,

By-Products

All waste pork in the Trimming Department is sorted out, rinds taken off, fat and lean separated and transferred to the Cooked Meat Department, where it is used in the manufacture of lard done up in ½ lb. blocks and also Frankfurters, Strasbourg, Salami, *Pâté de Tête*, etc.

ERRATUM

The Spray Drier

On page 197 of FOOD MANUFACTURE, June 1944 issue, the description of the Kestner Drying Chamber was incorrect in one respect. The author stated that the Kestner model employs two hot air streams, but only one is employed.

ACKNOWLEDGMENT

The Spray Drier

WE regret that in the article on the Spray Drier, published in the June issue of FOOD MANUFACTURE, due acknowledgments for the illustrations were not accorded.

We were indebted to the Kestner Evaporator and Engineering Co., Ltd., for the illustrations of their Spray Drying Plant on pages 195 and 196.

The diagram of Atomiser Disc at the foot of page 197 is that of the Kestner patent.

The Microphotographs of powders produced by (1) the jet atomiser and (2) the Kestner Patent Centrifugal Atomiser on page 198 were also supplied by the aforementioned company.

Control of Jam Manufacture

The maintenance of a stable quality of jam is one of the main problems of the modern jam manufacturer whether he is in a large or small way of business. But the problems of control are different. This article is concerned with the operations of the small man.

GEORGE RAUCH.

FACTORIES with a large output of jam usually have automatic weighing systems for pulp and syrup, have a stabilised steam supply, and work with the help of well-equipped laboratories. The absence of these in most small- and medium-sized factories makes the maintenance of a stable quality of jam a difficult problem. The solution is a balanced quality and production control—balanced because over-organised control systems in small factories usually defeat their own purpose, being a burden rather than a help.

There is no general standard of jam-boiling. Almost every factory has its own process of production and develops its peculiar quality, yet there are certain factors applicable to all good quality jams, and it is these factors which should be stabilised. They are :

(*a*) Percentage of soluble solids.
(*b*) Optimum percentage of inverted sugar.
(*c*) Acidity and *p*H value of jam.

Percentage of Soluble Solids

The British Standard Regulations provide for a minimum percentage of 68·5 per cent. of soluble solids for both first and second quality jams. It is therefore advisable to make up the recipes with a safety margin of at least 1·5 per cent.—*i.e.*, to 70 per cent. of soluble solids. The theoretical output of a correctly composed recipe should be based on the percentage of soluble solids of all its ingredients. Every ingredient has a certain amount of soluble solids, and as there is no loss of solids during the process of boiling it follows that the final product contains the total amount of solids of its ingredients. It is therefore necessary to establish the approximate percentage of soluble solids of every ingredient used.

The approximate figures for the main ingredients are :

(1) Sugar, 100 per cent. of soluble solids.
(2) Syrup, 82 per cent. of soluble solids (syrup of 43 degrees).
(3) Pectin, 10 per cent. of soluble solids (commercial pectin extract).
(4) Pulp, 7 to 19 per cent. of soluble solids.

We may regard (1), (2) and (3) as constant figures, but (4) varies according to the variety, consistency and degree of ripeness of the fruit used.

If the figures of voluble solids for the different ingredients are known, the theoretical output of the recipe may be readily calculated. The following may serve as an example :

Ingredients.	*Weight.*	*Soluble Solids.*	*Soluble Solids of Ingredients.*
	(*Lb.*)	(*Per Cent.*)	(*Lb.*)
Sugar	80	100	80·0
Strawberry pulp ...	24	10	2·4
Pectin extract ...	12	10	1·2
Total	116	—	83·6

In order to obtain the theoretical weight of the finished product containing 70 per cent. of soluble solids it is necessary to divide the total amount of

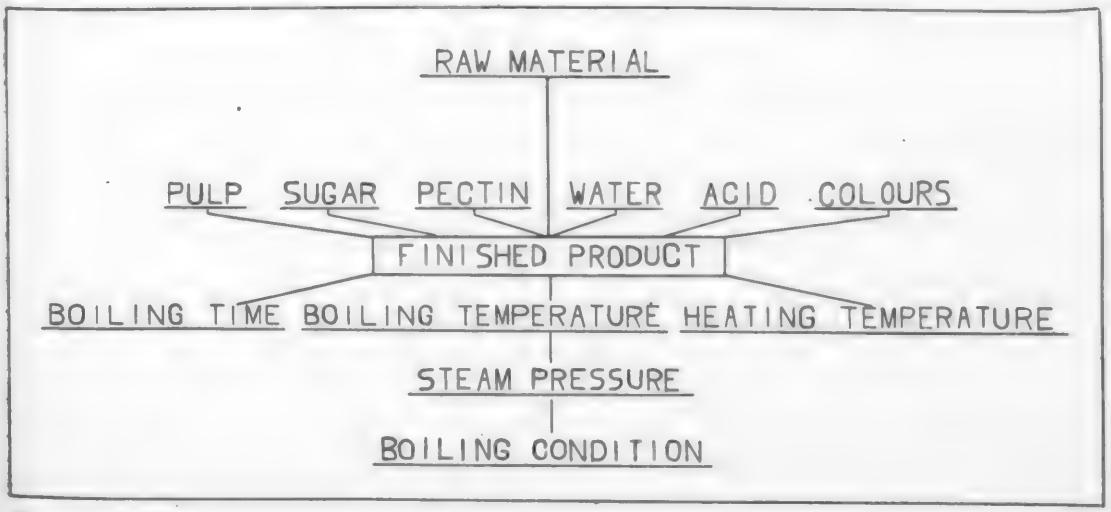


Fig. 1.

soluble solids of 83·6 lb. by the required amount of soluble solids of 70 and multiply by 100. The result, 119·4 lb., is the theoretical weight of the output.

The final determination of soluble extracts in the finished product is done by refractometer.

Optimum Percentage of Inverted Sugar

The amount of inverted sugar in jams should always be less than the amount of cane sugar present. The total soluble solids taken as a standard of 70 per cent. gives a maximum figure of inversion of 35 per cent. The lowest figure should be kept within 28 to 32 per cent. Inversion in the more acid jams should be kept down by the use of soda, and, in the non-acid jams, increased by the use of invert sugar or acid. The inversion of sugar is furthermore affected by the boiling time and boiling temperature.

*p*H Value and Acidity of Jam

The proper setting and the formation of jelly should be controlled by adjusting the *p*H value of pulp or fruit juice. No jelly formation takes place above about *p*H 3·6. The setting power increases by dropping the *p*H value to *p*H 3. Below *p*H 3 a tendency to sweating is observed.

In order to keep the aforementioned items stable, it is necessary to examine all the agents liable to affect soluble solids, inversion of sugar, and the *p*H content of jam. Two main factors are to be taken into account:

(*a*) The nature of the raw material.

(*b*) The conditions under which the jam production takes place.

Fig. 1 gives an indication of the different items involved.

The Raw Material

Sugar.—Sugar is one of the most stable raw materials used in jam production. Its content of soluble solids is about 100 per cent. It is obvious that special care must be taken in the weighing of sugar. Every pound of sugar is equal to approximately 1 per cent. of soluble solids in the finished product as shown in Fig. 2.

The figure is based on the recipe: Fruit 24 lb., pectin 12 lb., their amounts remaining constant. The variation in the sugar is shown on the curve. The theoretical output is 120 lb.

The weighing of sugar for every individual boil should be discouraged. Factories without automatic syrup and weighing plants may find an alternative solution by boiling sugar to syrup of the required specific weight and storing it at a steady temperature in large tanks. The control of the specific gravity with the sugar spindle is simple and accurate.

Pectin.—Pectin solution of commercial quality is fairly stable. In factory practice the determination of pectin based on calcium pectate is too complicated. Frequent jelly tests are, however, advisable.

Water.—As excessive boiling must be avoided, only the quantity of water absolutely necessary for the boiling should be added. In the interest of a stable quality the same amount of water should always be used.

Acid.—It is necessary to keep the acid content of jam fairly constant by increasing in some and neutralising in others. The acidity should not be more than 8 per

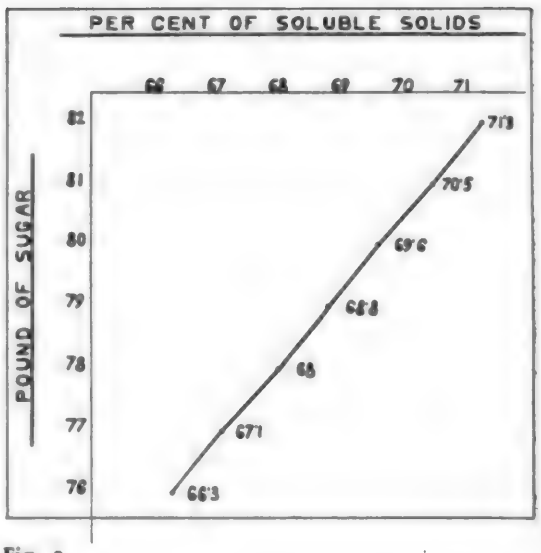


Fig. 2.

cent., but 5 per cent. can be taken as a standard and 3 per cent. as a minimum figure.

The use of lactic acid has certain advantages over the more generally used citric acid. Lactic acid is liquid and is usually sold in concentrations of 80 and 100 per cent. Lactic acid is wholesome, ready for use, stable in concentrations over 8 per cent., and does not form insoluble calcium salts. The addition of the right quantity of acid is important for the improvement of taste, for the setting and the inversion of sugar.

Colour.—Colours should be mixed in large containers. It is essential to keep the concentration and intensity of colours steady. All measures should be properly gauged to avoid any mistake. It is advisable to keep standard specimens of different varieties of jam in the boiling room to enable the jam boiler to control and check divergencies in shades.

Boiling Conditions

That the conditions under which the production takes place be constant is as important for the stability of the product as the raw material itself. The right adoption of the different boiling conditions makes jam-boiling a highly skilled job. Here again most factories develop their individual methods based on observation and experience. Nevertheless, there are rules which should be generally observed.

Boiling Time.—A short boiling time is of utmost importance for the preservation of colour and natural flavour of jam. It must be further remembered that excessive boiling greatly increases inversion of sugar. Essential factors for the boiling time are the proportion between the volume of the boiling pan and the heating surface, the heat-conducting capacity of the boiling mixture, the temperature of the heating surface, and the steam pressure.

During the process of boiling, part of the water content of the boiling mixture is evaporated. The larger the proportion between the content of the boiling pan in relation to the heating surface, the longer is the boiling time. This proportion becomes more unfavour-

able with the increase in size of the boiling pan. Most jam pans have a steam jacket in form of a half-globe. Provided the diameter of this half-globe is 50 cm., then the heating surface is 0·4 m², which is equal to a volume of 33 litres. If, however, the diameter rises to 1 meter, the heating surface rises to 1·6² m, which equals a content of 260 litres. It follows, therefore, that the boiling in the second case takes twice as long as in the first-mentioned example. The advantage of the smaller pan is obvious enough.

Using a boiling pan of 50 cm. diameter, a steam bubble has 25 cm. to rise from the bottom of the pan to the surface, whereas using one of 1 metre diameter the distance from the bottom to the surface increases to 50 cm. As a consequence the steam bubbles in the larger pan are overheated, which causes in turn the overheating of the boiling mixtures.

It is further important that jams, after they have finished boiling, must not be allowed to stand in the pan, as inversion greatly increases in this way. Therefore, immediately they are boiled they must be turned out and in no circumstances left in the pan.

Fig. 3 gives an idea of the great importance of temperature and boiling time in relation to the inversion of sugar. Example: It takes 328 hours for the full inversion of sugar at a temperature of 20° C., and only 11·2 minutes at a temperature of 80° C. This refers to inversion with N/10 hydrochloric acid.

Heating and Boiling Temperatures

Distinction must be made between heating temperature and boiling temperature. The first is the temperature necessary to work the boiling units; the second is the temperature needed to boil the jam mixture down to the theoretical weight of the recipe.

The heating temperature of the boiling unit is dependent on its steam pressure. In many small- and medium-sized factories the lack of a supply of a steady steam pressure is the cause of never-ending trouble. Most jam-boiling pans are constructed to work to a steam pressure of 60 to 70 lb. per square inch. It is absolutely essential to keep the steam pressure constant, and it is advisable to instal a pressure recorder, which produces a chart showing the steam pressure at any hour of the day.

Insulation of all parts of the steam pipe-line and immediate repair of steam leakages through defective valves or joints are of great importance.

The boiling temperature of jam depends on the specific gravity of the mixture and the actual air pressure. Both these factors vary continuously. The jam boiler's safest control is the weight of the finished product. Under normal conditions the variation between the effective and theoretical weight should not exceed plus or minus 2 lb. Every single boil should be weighted. After the right weight is found the final temperature serves as a guidance for future boils. However, the weight of the finished product remains the final test because the final temperature has to be adjusted according to the varying air pressure and the consistency of the mixture.

The Laboratory

In order to produce uniform results with varying material and continuously changing boiling conditions, a systematic analytical control is necessary. Every factory, however small, should have a laboratory for routine tests such as acid content in pulp and jam, inversion of sugar, and checking of soluble solids.

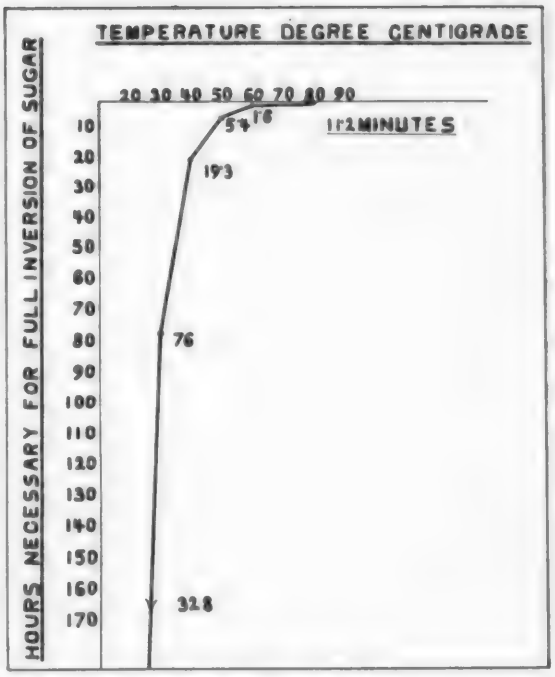


Fig. 3.—Inversion with N/10 HCl.

Correspondence

Protein Content of Macaroni

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—We were interested in the abstract of the talk by Donald S. Payne on the desirability of increasing the protein content of macaroni.

This policy has been acted upon by us on a commercial scale for a number of years. Our original object in making protein-increased cereal products was to reduce starch content for diabetics, but in recent years these foods have taken on a wider significance. The lowered protein intake of the countries at war will make it increasingly desirable to be able to introduce protein unobtrusively into the diet.

We have always used wheat gluten as our protein, and in the case of macaroni have succeeded in getting the protein up to 23 per cent. without materially altering either appearance or handling.

Regarding the relative nutritional values of gluten and soya, glycinin has been accepted as a first-class protein, but it is not as generally known that glutenin, which constitutes about 25 to 30 per cent. of wheat gluten, is also a first-class protein, while gliadin, which forms the bulk of the remainder, is able to *maintain life* while not allowing normal growth, due, presumably, to its deficiency of lysine.

Yours faithfully,

A. F. JACKSON,

Chemist, Energen Foods Co., Ltd.

Trade News

W. E. Smith (Manufactured Products), Ltd.

From May 7, 1944, the Food Manufacturing and Packing Section of the business of the late W. E. Smith was taken over by W. E. Smith (Manufactured Products), Ltd.

The Fresh Fruit and Vegetable Section will be taken over by Messrs. W. E. Smith (Fruit Merchants), Ltd., with whom the company will be associated.

* * *

Changes of Address

Mac-Rex Food, Ltd., have moved from 390, York Road, S.W. 18, to their new premises at Farouk Buildings, Stanlake Villas, Shepherd's Bush, W. 12. Tel. No. Shepherd's Bush 2978.

The business will continue under the personal supervision and attendance of Mr. H. A. Nabi.

The company has recorded its appreciation of the courtesy and help given by the Cereal Division of the Ministry of Food in connection with their new factory, the equipment of which, they claim, will be considered unique in the macaroni industry in Great Britain.

* * *

Pumping Corrosive Liquids

The earliest type of acid pumping was by means of the acid egg, but this was soon replaced by equipment which automatically raised the liquid to the height required by means of compressed air. Kestner Evaporator and Engineering Co., Ltd., are the originators of continuous pumping by this means. Following their acid elevators, they produced their patent glandless acid pumps, and the latest development, described in Leaflet No. 269, is a pump which is not only glandless but also self-priming. There are three types of glandless pumps: the vertical and horizontal centrifugal types and the plunger type.

The self-priming pump has been developed to overcome priming. It will start up against a negative suction head without any foot valve or other method of priming being necessary and yet retains all the advantages of the standard type units. The main difference is that a special suction chamber is provided which ensures that the pump chamber is flooded with liquid and freed from air. When it stops running re-priming is brought about by liquid returning from the delivery line or from a delivery vessel where the pipe line is extremely short.

* * *

Stainless Steel and Food

For the past five years engineering developments in design and production have been intensely operated in great secrecy. This is true of stainless steel plant, which has contributed in enormous tonnage to the present strong position in which the Allies find themselves. The value of these alloys to the war effort has recently been partly emphasised by the international negotiations on the disposal of wolfram from the Iberian Peninsula.

Many of these developments will be available to the food industries when peace comes. Food, the raw material of our well-being, will require to be processed under the most hygienic conditions, and to this stainless steel will offer its hard, incorrodible and polished surface.

The food industries had already recognised its value, and during the 1930s it became established as the standard material for many types of plant. Particularly was this true in the development of the modern dairy, which coincided with the availability to industry of welding quality stainless steel. This introduction to the welding industry broke down the final barrier to large-size fabrication by welding. Prior to the availability of welding quality stainless steel, all welded structures had to be heat treated to 1,100° C. to re-establish the corrosion-resisting qualities of the material.

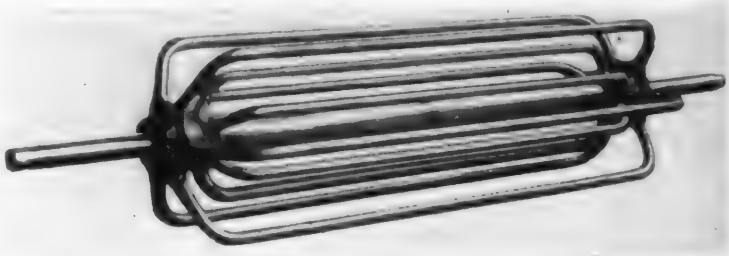
A good example of a complicated fabrication made possible by the modern steels is that shown in the illustration. The unit is a rotating heat exchanger of stainless steel throughout. The end shafts were machined separately before welding and yet the distortion was so controlled that after welding the shafts were true one with another well within the maximum prescribed limit of a few thousandths of an inch.

* * *

Essence Man on Sales Committee

Mr. S. H. Jones, of the sales staff of Messrs. William Pender, Ltd., coffee essence and sauce manufacturers, Edinburgh, has been appointed a vice-chairman of the Edinburgh branch of the Incorporated Sales Managers Association, at the annual meeting held recently.

Also on the executive are many well-known men in the packaging field. Mr. Barclay, of the Thampson and Norris Manufacturing Co., Ltd., is also a vice-chairman, while Mr. W. M'Intosh, of Glaxo Laboratories, Ltd., is treasurer. The immediate past chairman of the branch is also a well-known packaging and cartonmaking man, Mr. J. V. H. Brown, of William Thyne, Ltd., Edinburgh.



Tufnol Ltd.

From June 5, Ellison Insulations, Ltd., the makers of Tufnol, changed their title to Tufnol, Ltd.

There is no change in the directorate of the firm, in its policy, or in the addresses of its offices, which remain as before at Perry Barr, Birmingham, 22B; 36, Bennetts Hill, Birmingham, 2; 121, Victoria Street, Westminster, London, S.W. 1; Kent House, 21, Spring Gardens, Manchester, 2; and 11, High Croft Avenue, Croftfoot, Glasgow, S. 4.

* * *

Edinburgh Firm's Service Record

The fine service record of two members of the staff of the United Wireworks, Ltd., Edinburgh, manufacturers of mesh sieves for the food and allied industries, was celebrated by their colleagues at a special dinner held recently in Edinburgh. Mr. J. Burnett, the retiring secretary of the company, with 54 years' service, and Mr. J. M'Watters, retiring chief engineer, with 40 years' service, were both given a send-off and wishes for a happy retirement by some 60 members of the firm's staff.

* * *

Self-Operating Thermostats

Modern cold storage and refrigerating equipment is designed with a full appreciation of the importance of maintaining exact temperatures suitable for the product handled.

There are, however, many cold storage plants in operation, where cold room temperatures are controlled by hand. This is both troublesome and unreliable, especially in these days of unskilled labour. Frequent opening of doors in order to adjust the room temperature results in losses.

Where cooling is accomplished by brine circulation, the addition of simple automatic controls will improve efficiency of the cooling plant and avoid waste of labour.

Messrs. Sarco Thermostats, Ltd., have specialised in making simple self-operated temperature regulators for brine temperature control. The operating principle is as follows:

A thermostat containing a temperature sensitive liquid is connected by means of a capillary tube to a valve operating element, which actuates by internal pressure the brine flow control valve. For cooling purposes this valve is "reverse" acting—*i.e.*, it opens with rise in temperature and *vice versa*.

The absence of packed glands on Sarco regulator valves is decidedly an advantage to be appreciated.

The figure shows the installation of a temperature regulator on discharge end of brine coil. The flexible tubing between thermostat and regulator valve makes it impossible to install the

former (temperature sensitive element) in the most convenient position within the cold room.

Sarco temperature controllers have been installed in the tropics, controlling brine flow to drinking water coolers. They have been installed in refrigeration rooms on brine coils of various types. They are widely used in air conditioning plants, providing constant room temperatures.

Another type of controller is the Sarco themostatic blender, which uses the same self-acting principle. It is used on the brine section of milk coolers, on unit coolers in cold storage rooms for food, etc. These blenders for brine recirculation control are made to provide a wider range of adjustment, which is necessary because of the low temperatures at which the brine blenders most frequently operate.

A few installations in which the firm's refrigeration controllers are working: dairies, cold storage plants, warehouses for food storage, cooling installations aboard ship, on testing equipment for low temperatures in the canning industry.

* * *

Scottish Pig Producers Association

A meeting of pig breeders and feeders drawn from many parts of Scotland decided in Glasgow to form the Scottish Pig Producers Association, with the object of safeguarding the interests of pig traders, particularly in relation to post-war conditions.

Mr. John Brown, of Glasgow, who presided, stressed the need for organisation in the pig-breeding industry in view of the many problems that lay before them. It was felt that they ought to be able to speak with one voice when matters concerning their industry came before the Government.

* * *

Insecticide Manufacturers Association

At the Annual General Meeting of the Association of British Insecticide Manufacturers the following officers and Executive Committee were elected for the year 1944-45:

Chairman, Mr. H. J. Jones (Hemingway and Co., Ltd.); *Vice-Chairman*, M. T. Ainslie, Robertson (Plant Protection, Ltd.); *Honorary Treasurer*, Mr. R. V. Craven (W. J. Craven and Co., Ltd.); *Honorary Auditor*, Mr. R. A. Blair (Burt Boulton and Haywood, Ltd.); *Executive Committee*, Mr. A. Berk (F. W. Berk and Co., Ltd.); Mr. R. V. Craven (W. J. Craven and Co., Ltd.); Dr. E. Holmes (Imperial Chemical Industries, Ltd.); Mr. H. I. Kingston (Geo. Monro, Ltd.); Mr. J. S. Mitchell (Murphy Chemical Co., Ltd.); Dr. T. F. West (Stafford Allen and Sons, Ltd.).

Mr. A. J. Holden, B.Sc., F.I.C., and Mr. W. A. Williams, B.Sc., continue to act as Assistant Secretaries of the Association in the continued absence of M. J. Davidson Pratt on war service.

Dairy and Ice Cream Equipment Association

Mr. Graham Enoch took the chair at the Sixth Annual General Meeting of the Dairy and Ice Cream Equipment Association. Reviewing the past year, he said that war conditions had prevented the development of the social side of the Association's activities. On the exploratory and educational side, there had been a busy and progressive year.

Among the noteworthy events had been the formation of the Dairy Engineers Association and the Society of Dairy Technology. The former had taken place under the auspices of the Association.

Among the questions under review by the Association were the drawing up of an inventory of the various bureaux and research bodies with full particulars of what information and assistance they are able to supply and which would be at the disposal of the members of the Association.

Turning to post-war matters, the chairman mentioned the desirability of running a single Dairy Show instead of two. Another point which was occupying the committee's attention was the promotion of a training school for dairy operators.

Mr. Graham Enoch was re-elected president for the ensuing year, and Dr. H. B. Cronshaw honorary secretary and treasurer.

* * *

Association of Boiler Setters, Chimney and Furnace Constructors

The First Annual Report of the Association for the year ending March 31, 1944, was issued recently.

It covers the first year's work of a new Association, and as such may perhaps be read with more than normal interest.

About fifteen months ago Controls, Departmental Regulations, requirements of National Service and such-like seemed to threaten the continuation of independent existence of many firms, and a primary factor influencing co-operation was certainly that of self-preservation. As soon as the nucleus of this co-operation appeared, other more positive factors became obvious. The Association, then, was formed, and this fact alone accomplished the first, somewhat negative objective. An Executive Committee was appointed to formulate the objects and rules and to get the work of the first year under way. Its early work consisted in making representation to the Ministries of Labour, Works and Fuel, and this has continued through the year.

* * *

The London Chamber of Commerce (Incorporated)

At the Annual General Meeting of the London Chamber of Commerce Major-General Sir Evan Gibb, K.B.E., C.B., C.M.G., D.S.O., was re-elected President of the Chamber for the ensuing year, having already held this office for one year.

Sir Evan Gibb is associated with Sir Alexander Gibb and Partners, Consulting and Chartered Civil Engineers, of Westminster, and is a Director of Rubislaw Granite Co., Ltd.

Among those elected members of the Council were:

Lieut.-Colonel G. R. Harding, D.S.O. (a Director, Aplin and Barrett, Ltd., Food Manufacturers, and Gardners [Bristol], Ltd.), Chairman of the Council, Past Deputy-Chairman of the Council, and Past Treasurer of the Chamber; Charles S. Wilson, M.C. (Life Governing Director, Campbell and Phillips, Ltd., Colonial Produce Commission Merchants), Past Chairman of the London Court of Arbitration; Donald G. Begg, M.B.E., Chairman, Argentine and Uruguayan Section; W. J. Thompson (Senior Partner, W. J. and H. Thompson, Tea, Coffee and Rubber Brokers); Alan M. Gillies (Partner, Davidson, Unwin and Co., Brazilian Merchants); Phillip Nesbitt (Managing Director, Gollin and Co., [Pty.], Ltd., Australian and New Zealand Merchants), Deputy-Chairman, Rayon Exporters Section.

* * *

Death of Soya Flour Pioneer

The death of Mr. Robert Graham in Glasgow in early June recalls the pioneer work which this flour expert did for soya at a time when its virtues were less universally appreciated than they now are.

A native of Fife, he was associated early with the Pitlessie maltings and gained a very comprehensive knowledge of the grain trade there. He left to found the old Veda Bread Company in 1900 and his subsequent travels took him all over the world. He went to America, where he did considerable research and marketing work in the flour and bread field, and then to Russia, where he carried on famine relief work after the last war.

Shortly after this work he went to Austria, then also in a decimated condition, to carry on similar work, and introduced the now-famous soya bean flour in a bread which he appropriately named "Manna." This bread was used to feed the hungry in the war-wasted countries of Europe. He had latterly been living in his native county at Paitlair, in the Howe of Fife, and was 89 years of age when he died.

* * *

Rehabilitating the War-Disabled

The British Legion has recently issued the following:

What does the future hold for men who, in winning the war, lose their physical capacity for enjoying the peace? Will the worker who has lost a limb be awarded some paltry pension and then cast on the industrial rubbish heap of unemployment? According to the Government the answer is most definitely — No! Sir Walter Womersley, addressing members of the British Legion—of which he himself is a member—declared that "money compensation is all right to a reasonable amount, but the real thing is to help a man to help himself, and give him self-respect and the opportunity of standing alongside his fellow men and work as well as them." The best brains in the Government, added Sir Walter, are now engaged in planning an extension, in post-war years, of the existing scheme for the rehabilitation of the disabled. The ultimate success of any Government plan, however, depends to a large degree on the willingness of the various industries to provide the disabled man with the opportunity of doing a skilled job. The idea that a man who has lost a

limb, particularly an arm, is unfitted for skilled employment and can only expect work of a menial character is not merely unfair to the individual but, generally speaking, absolutely erroneous. His capacity for concentration is usually highly developed and he often possesses a high degree of manual dexterity. Factors such as character, intelligence, age and experience are more important than the disablement itself in determining capacity and, as employment is the object in view, the factor of disablement should be considered not in its personal sense but in its relation to employability. It is essential, therefore, in the interests of the country as a whole, that every facility be provided in helping these men to obtain worth-while jobs, for disablement represents a double loss to the community: a reduction of the total productive capacity and an increase in the cost of maintenance and remedial services. The rehabilitation of the disabled is, quite apart from a national responsibility, an economic necessity.

* * *

Food Manufacturers' Assn.

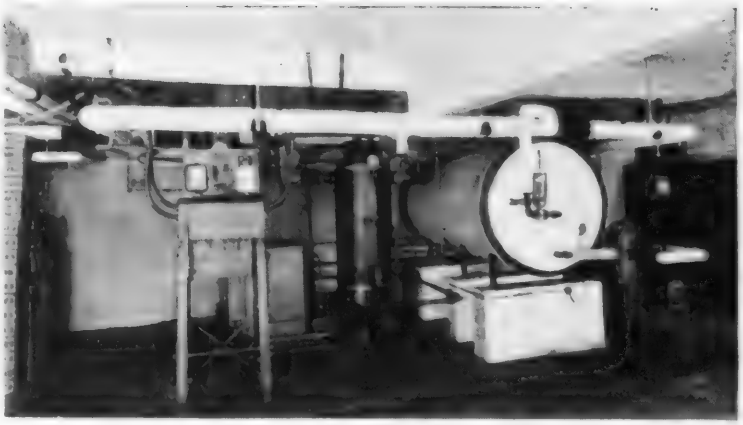
At the annual general meeting of Liverpool and District Food Manufacturers' Association, Mr. J. H. Blackburn (J. A. Hunter and Co., Ltd.) was re-elected chairman.

Mr. George Moore (Richmond Sausage Co., Ltd.) was elected secretary for the ensuing year in place of Mr. H. C. Gibson (Gibson Bros., Ltd.) who retires.

* * *

Electric Steam Generation

For food factories and other industrial establishments, as well as hotels, restaurants, clubs, and blocks of flats, using smaller steam boilers of sizes up to, say, 3,000 to 3,250 lbs. evaporation per hour (equivalent to, say, 450 to 550 lbs. of coal or coke per hour) operation by means of electricity possesses a series of important advantages. With any reasonable price for current, such as 0·30d. to 0·60d. per unit, the net cost of generating steam by electricity is often no more than town gas, oil, coke, or coal.



30 kw. Automatically Controlled Electrode Steam Boiler.

The latest practice in electric boilers of the "electrode" type for A/C current is represented by the work of Bastian and Allen, Ltd., who make both types of steam and hot-water boiler (electrode and resistance) and other electric heating equipment. The electrode boilers are available in a standard range of self-contained automatically controlled vertical units with complete mountings and boiler feed pump, 25 to 1,200 kw. for A/C current at, say, 346 to 440 volts 3-phase 50-cycles evaporating 75 to 3,250 lbs. of water per hour at any pressure up to 120 lbs. per sq. in. gauge (230 lbs. test pressure).

The advantages of electric steam boilers as compared with the use of fuels include extremely small size and total space occupied. With the above make in the range of 25 to 1,200 kw. the over-all height is 3 ft. 6 ins. to 8 ft. 2 ins., and the diameter only 1 ft. 7 ins. to 3 ft. 4 ins. Another important advantage is simplicity, with no labour other than a few moments for operating the starting and control switches.

There is also remarkable flexibility both of installation and operation, since an electric boiler can be placed almost anywhere as there are no foundations, chimney flues, equipment for draught and fuel storage. The boiler can be started up from cold and be at full pressure almost in a few minutes, so that it is not necessary to keep boiler "under steam" waiting for the demand.

The continuous thermal efficiency of an electric boiler is extraordinarily high, averaging about 98 per cent. with a very slight loss of heat by radiation, the boiler being heavily lagged with 2-in. magnesia-asbestos blocks encased in planished steel with stainless steel bands and screws. Fuel operation is generally much less than 50 to 60 per cent. for continuous work.

* * *

Industrial Pest Control Assn.

At the Annual General Meeting of the Industrial Pest Control Association, held on May 31, 1944, the following Officers and Executive Committee were elected for the year 1944-1945:

President: Dr. E. Holmes (Plant Protection, Ltd.); *Vice-President:* Mr. A. F. McIntosh (Thomas Harley, Ltd.); *Honorary Treasurer:* Mr. S. F. Sprange (London Fumigation Co., Ltd.); *Executive Committee:* Mr. F. H. Braybrook (Technical Products, Ltd.), Mr. C. S. Kregor (W. Edmonds and Co., Ltd.), Mr. E. McLaren (Haller Laboratories, Ltd.), Mr. T. Napier (Imperial Chemical Industries, Ltd.), Mr. J. E. R. Simons (Geo. Monro, Ltd.), Mr. J. B. Wilton (Fumigation Services, Ltd.).

Secretarial services for the Association are now provided by the A.B.C.M., 166, Piccadilly, London, W. 1, and Mr. A. J. Holden, B.Sc., F.R.I.C., and Mr. W. A. Williams, B.Sc., of the permanent staff of the latter, will undertake the secretarial duties.

Overseas Items

Whales Ease Portuguese Food Shortage

Whales caught on the Portuguese coast are considerably easing the Portuguese food shortage.

Whale-meat is now being sold in Lisbon butchers' shops at 6d. a lb. Housewives are instructed to cook it as though it were beef, which it resembles in flavour.—*Reuter.*

* * *

Apricot Pulp Contract

A contract has been signed in Madrid between the Fruit Syndicate and the United Kingdom Commercial Corporation for the purchase by Britain of 7,000 to 10,000 tons of apricot pulp.

The value is estimated at well over 20,000,000 pesetas (about £500,000) and shipment will be made in British vessels.—*Reuter.*

* * *

Brazil Rice for European Relief

Brazil will provide three million bags of rice for relief feeding for occupied Europe, according to the decision of the committee formed to determine Brazil's contribution in this connection.

The committee has also fixed quantities of coffee and other foodstuffs to be provided.—*Reuter.*

* * *

New Zealand asked for More Butter

Mr. W. Bankes Amery, head of the British Food Mission in Australia, said he wondered how far it was generally realised in New Zealand that it was possible to eat in a single day almost as much meat or butter as would keep a person in Britain going for a whole week.

He was speaking on the conclusion of a tour of many New Zealand farming districts and added that Britain was relying mainly on Australia and New Zealand for the maintenance of her two-ounce butter ration.

If New Zealand could contrive to halve the difference between the pre-war average and her present exports, anxiety would be removed.—*Reuter.*

Antioxidant for Lard

The use of vegetable oil containing tocopherols as an antioxidant in lard and rendered pork fat has been approved by the Meat Inspection Division, War Food Administration, in Memorandum 29. The memorandum states that a preparation consisting of 30 per cent. concentration of tocopherols in vegetable oil may be added as a preservative to the products designated as lard and rendered pork fat in a quantity not to exceed $\frac{1}{10}$ of 1 per cent. of the vegetable oil preparation.

When the preservative is used, the statement "With not more than $\frac{1}{10}$ of 1 per cent. of vegetable oil containing tocopherols added as a preservative" shall appear on the label in direct connection with the term "lard" or "rendered pork fat," as the case may be.

According to H. R. Kraybill, director of the American Meat Institute Department of Scientific Research, tocopherols are phenolic-like compounds found in vegetable oils. They have antioxidant properties when used alone or in conjunction with lecithin and are associated with vitamin E activity. It is not known whether tocopherols are available commercially, although it is understood that they are being produced.

* * *

Ersatz Vitamins

Workers in Germany's underground armaments factories are being given a new vitamin food, called "Auzon," to keep up their efficiency, reports the Berlin correspondent of the newspaper *Aftonbladet*.

Auzon has been evolved by Professor Koliath of Rostock, is made of oats mixed with various other kinds of grain, and has been patented as a concentrated vitamin extract.

Walter S. Triebeck, an Essen engineer, used the food on a worker and found that the man's intelligence, technical capacity, power of concentration and ability to stand monotonous tasks rose 20 per cent.—*Reuter.*

More Canadian Bacon for Britain

Mr. James G. Gardiner, Canadian Minister of Agriculture, announced in the House of Commons that a four-year bacon agreement had been negotiated with Britain.

The agreement, he said, had not been signed and there might be some minor changes, but the plan was that Britain would take as much bacon from Canada during the next four years as she did during the last four years.

The new agreement, he said, would cover the years 1944 to 1947 inclusive.

Last autumn Mr. Gardiner announced that a contract had been made for the shipment of not less than 900,000,000 lbs. of bacon to Britain in 1944 and 1945.

He told the House of Commons: "We are well on the way to supplying Britain this year with the whole quantity of 900,000,000 lbs. which we agreed to supply her in two years."—*Reuter.*

* * *

New Tractor Invented

Details of a new tractor implement unit which, it was claimed, would enable one man to operate a thirty-acre farm with less than half the effort previously required, were given in Washington by Mr. Barry Ferguson, its Irish inventor.

It can be operated by a young boy or girl, Mr. Ferguson said, and does everything from ploughing and harrowing to digging post holes and sawing wood. It will entirely eliminate the need for the work of animals on farms, the inventor claims.

Mr. Ferguson told officials, agricultural experts and business men who saw his machine demonstrated that he and Mr. Henry Ford, who were already producing the tractor in small numbers, hoped to manufacture millions after the war.

"The only reason that Britain has lost the benefit of the tractor during the war and will lose its tremendous manufacturing asset after the war is that the Ministry

of Agriculture has put every possible obstruction in my way to prevent my getting started when a start could easily have been made," stated Mr. Ferguson.

An official of the Ministry of Agriculture, denying this allegation, told Reuter: "We know all about the Ford-Ferguson tractor, and greatly appreciate its work in lighter soils. It is a most useful contribution to British agriculture, and we hope that it will play an important part in our post-war production. Present production is an extremely complex problem."

* * *

Exchange Rate for Argentine Exports

It is officially announced that the preferential exchange rate of 398·01 pesos per hundred dollars will continue in force for exports of wolfram, sunflower and peanut oil.—*Reuter.*

* * *

Australia's Meat Exports

Australian exports of frozen meat carcases to the United Kingdom increased 118 per cent. in the four-months period since the rationing was introduced, compared with the corresponding period of last year, it is announced by Mr. Scully (Commonwealth Minister of Agriculture) in reply to recent suggestions that such exports recently had not been fully satisfactory.

In addition, he says, substantial shipments of dehydrated mutton and canned meats have been made.—*Reuter.*

* * *

Swedish Agricultural Developments

Recently published figures show a marked improvement in the efficiency of Swedish agriculture during the last sixty years. Sweden is to-day feeding 6½ million people easier than 4½ million in 1880; and this in spite of the fact that her agricultural population has decreased during this period from 3 to 2 million. The average crop yield per hectare has increased considerably during the period in question, the main increases being: oats by 87 per cent., autumn rye by 36 per cent., autumn wheat by 68 per cent., and potatoes by 85 per cent. Cow milk production has increased by 100 per cent.

This process of rationalisation has continued during the years 1930-1940; and the figure of crop yield per hectare was ten times higher during that period than during the years 1925-1929. Production increase reached its peak during the years 1930-1940, when milk production increased by 151 kilos per cow.

Agricultural labour has decreased considerably, but all available labour has been better utilised and many men have been replaced by machines.

Sale of agricultural machinery in Sweden has risen from the value of Kr. 155 million in 1929-1930 to nearly Kr. 25 million during 1935-1936.

* * *

The F.A.O.

A formal agreement to set up an International Food and Agriculture Organisation—the F.A.O.—in permanent form is expected to be reached at a meeting of the representatives of the United and Associated Nations shortly.

The F.A.O., set up alongside the I.L.O. and other international agencies, will be the first of the permanent organisations of a specialised kind to be founded as a result of post-war aspirants in the present war. An interim commission on food and agriculture has prepared a draft of a detailed and practical constitution for the permanent organisation now being considered by the Governments of the United Nations.

This draft is still in a confidential stage, but agreement in principle is understood to have been reached in a preamble outlining the objects of the organisation as follows:

The United Nations being determined (1) to work separately and together to the end that want, and fear of want, shall be progressively abolished; (2) to take all measures within their power to raise the level of nutrition and the standards of living of the peoples under their jurisdiction; (3) to improve the efficiency of agricultural production and distribution and being resolved to co-operate internationally for the achievements of these ends; (4) thereby to establish the food and agricultural organisation of the United Nations.

Article 1 of the Constitution reiterates these objectives and further enjoins the organisation to promote the common welfare "by furthering separate and collective action by the member nations, to better conditions of rural populations and to contribute towards expanding world economy."—*Reuter.*

* * *

Quinine in a Milkcan

Cinchona bark is the raw material from which quinine is made—the standard medicine for the prevention and cure of malaria.

Colonel Arthur Fisher, who twenty years ago was head of the Philippines Bureau of Forestry, established cinchona plants in those islands. After Pearl Harbour Colonel Fisher, at the risk of his own life, spirited two million seeds out of the islands. They were packed in a milk can, flown to Australia and then to Washington.

That shipment of seeds is already paying big dividends. Grown in United States Department of Agriculture greenhouses, thousands of seedlings from these seeds have gone to tropical America by aircraft for planting in those countries.

Because of those seeds, rescued from under the very noses of the Japanese, many an American doughboy or British Tommy fighting in the jungles of the South Pacific will have a better chance to survive the dangers of malaria.

Potato Spraying in Industrial Areas

In the neighbourhood of industrial areas, spraying potato haulm with Bordeaux or Burgundy mixtures, or dusting with copper powders, may do more harm than good, owing to the action that takes place between the spray and acid fumes in the atmosphere. Within ten or twelve miles of a large industrial centre it is always advisable to seek advice on spraying or dusting from the County War Agricultural Executive Committee.

News from the Ministries

Mr. William Wallace

Mr. William Wallace, Director of the Cocoa, Chocolate and Sugar Confectionery Division since 1940, has asked for relief on grounds of health and increasing responsibilities, and Mr. Eric D. Macintosh, Deputy Director of the Division, has therefore been appointed Director jointly with Mr. Wallace as from May 1.

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Sir Hubert Carr, K.C.I.E.

Sir Hubert Carr, K.C.I.E., Director of Tea and Coffee in the Ministry of Food, has found it necessary to relinquish his appointment owing to ill-health. The Minister has regretfully accepted his resignation and desires to take this opportunity of expressing his appreciation of Sir Hubert Carr's services to the Ministry.

As from June 1, 1944, Mr. Henry Jones, Deputy Director of Tea, was appointed Director of Tea and Mr. S. G. Cuff, at present Assistant Director, Deputy Director.

* * *

The Seeds (Amendment) Regulations 1944

The Ministry of Agriculture and Fisheries has had under consideration the question of the improvement of the Regulations made under the Seeds Act, 1920, in regard to the classification of seed potatoes. The present Regulations—The Seeds (Amendment) Regulations, 1935—lay down a classification which is primarily geographical and admittedly misleading as an indication of comparative quality. Following consultation with the interests concerned, it was considered necessary to introduce a revised system of classification which would measure quality by health and purity as indicated by the certificates granted by the Agricultural Departments of the various countries under their inspection and certification schemes. The Ministry, therefore, proposes to issue amended Regulations, superseding those of 1935, in order to give effect to this improvement.

Under the proposed Regulations, the seller will be required to give the purchaser *inter alia* a statement as to the class of the seed potatoes—*i.e.*, whether they are Certified (Scotch), Certified (Northern Ireland), Certified (Eire), Certified (English), Certified (Welsh), Certified (Isle of Man), Uncertified (English once-grown), Uncertified (Welsh once-grown), Uncertified (Scotch), Uncertified (English) or Uncertified (Welsh), and also, in the case of the certified classes, a statement of the reference letters and number of the relative certificate. The various classes are defined in the proposed Regulations. Apart from drafting alterations, the present Regulations will otherwise remain unchanged.

The proposed Regulations will apply to seed potatoes obtained from crops growing in 1944, and in subsequent years, and it is intended that they shall come into operation in August, 1944.

Copies of the Draft Amending Regulations may be obtained on application to the Ministry of Agriculture and Fisheries, Block 4, Bickenhall Mansions, London, W. 1.

* * *

Gifts of Soap and Home Produce

Since December, 1942, it has been permissible for a person to supply by way of gift any foodstuff obtained from a retailer by means of a ration document. The Minister of Food has now made an Order extending this permission to gifts of soap from a retailer by means of a ration document. The new Order also legalises gifts by self-suppliers of bacon, pork or offal derived from a pig, except where the licence to slaughter the pig otherwise provides. Gifts of home-made chocolate, chocolate confectionery and sugar confectionery have also been made permissible.

The Amending Order came into operation on June 12.

Island Sand to Grow Food

The white sands of Calgary Bay, North-West Mull, are to be used to increase food production. Experts of the Ministry of Agriculture and Fisheries found the sand largely composed of powdered lime, and supplies are to be made available for farmers and crofters on the island. It is stated that Mull will no longer require to import lime.

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Changes in Fat Entitlement Permits

The Ministry of Food announces that as from the permit period commencing June 25, 1944, flour confectionery bakers whose six months' datum usage of manufacturing butter, margarine and cooking fat (including lard) combined, amounted to 80 cwts. or more, and whose total fat entitlement for eight weeks amounts to a minimum of 7 cwts., will receive 10 per cent. of their fat entitlement in the form of butter fat, and the remainder in the form of other fats. Adjustments will be made to meet movement of population and permits will be issued accordingly.

* * *

Edible Oils and Fats

The Minister of Food has made a new Order—the Edible Oils and Fats (Control of Sales) Order, 1944 (S.R. & O. 1944 No. 672)—which comes into force immediately.

This Order consolidates the Edible Oils and Fats (Control of Sales) Order, 1943 (S.R. & O. 1943 No. 701), and the subsequent amending Order (S.R. & O. 1943 No. 1451).

Under the new Order cocoa butter may be supplied to or obtained by trade-users for pharmaceutical purposes without a buying permit. There are no other changes.

Societies

Society of Chemical Industry

A joint meeting of the London Section of the Society with the London Section of the Institute of metals will be held in the hall of the Institution of Mechanical Engineers, Storey's Gate, London, S.W. 1, on July 13, 1944, when Mr. A. R. Powell will give a paper on "The Minor Metals."

* * *

Soc. of Instrument Technology

A Society, with the above title, has been formed for those interested in the design, manufacture, use and maintenance of scientific instruments.

Its objects are:

(*a*) The advancement of instrument technology by the dissemination and co-ordination of information relating to the design, application and maintenance of instruments.

(*b*) The provision of opportunities for discussion, particularly between the designers and manufacturers on the one side and the users on the other.

(*c*) The provision of opportunities for discussion and collaboration between the Society and other associations.

(*d*) The encouragement of technical education for persons who wish to enter, or are already in, the industry dealing with instrument research, design, manufacture or use.

(*e*) The encouragement of research into problems relating to instrument technology.

(*f*) To encourage the standardisation of instruments and accessories by collaboration between manufacturers and users.

(*g*) The determination of a commonly acceptable terminology.

(*h*) Enhancing the status and prestige of those employed in the industry.

Those interested are invited to send their names and addresses to the Hon. Secretary, who will forward details of membership and an application form. The Secretary's address is: 55, Tudor Gardens, London, W. 3.

It is intended to call a general meeting, probably in the early autumn, at which the Constitution and Rules, as recommended by the Council, will be submitted for the formal approval of intending members.

Society of Chemical Industry Agriculture Group

The following is the Report of the Hon. Secretary for the year 1943-44:

The subjects of papers read at meetings held during the year were:

1. "The Use of Lime in Agriculture," by W. M. Davies.
2. "The Planning and Equipment of Farm Buildings," by G. Rosenberg.
3. "Mineral Metabolism of Animals in Relation to Deficiency Diseases," by S. J. Watson.
4. "Our Fertiliser Industry," by P. Parrish. Joint with Birmingham Section.
5. "Potato Canning." Joint with the Food Group.
6. "Soil Sterilisation." Symposium joint with the Microbiological Panel of the Food Group and the Association of Applied Biologists.

Very few members of the Agricultural Group attended the joint meetings or, it must be stated, those at which they comprised the whole audience. Attendance of members at separate meetings of the Group varied from six to twenty. If the Group is to continue, means must be found for raising these depressing attendances. Average attendance during the preceding year, when the Group was new, was about seventy.

Mr. A. G. Pollard was appointed Joint Hon. Secretary. During the year Mr. J. H. Hamence and Mr. J. Byron joined the Committee.

The number of members on May 15 was 177.

The following meetings have been arranged for the forthcoming session:

October 17, 1944. Soil Insecticides. At Rothamsted.

November 14, 1944. Grass Drying. Joint with Chemical Engineers.

December 19, 1944. Weed Control. In London.

February 17, 1945. Veterinary Medicines. Joint with Nottingham Section, at Nottingham.

March 20, 1945. Protein Production and Animal Nutrition. In London.

At the first Annual Meeting of the Group the following officers were elected: *Chairman*, Sir John Russell; *Deputy Chairman*, Dr. L. H. Lampitt; *Hon. Secretary*, Mr. G. V. Jacks; *Hon. Treasurer*, Lieut.-Col. J. P. Pollitt; *Hon. Recorder*, Mr. W. L. Hill.

Dr. Cullen also proposed and Lieut.-Col. Pollitt seconded Mr. W. L. Hill as *Hon. Auditor*. Agreed.

Messrs. B. T. Barker, R. T. Colgate, Wm. Cullen, K. B. Edwards, J. C. Farrant, C. Denton Hornby, T. Rendle, R. E. Slade, W. K. Slater, and S. Robson were elected ordinary members of the Committee for the ensuing year.

Dr. Bernard Dyer proposed Dr. J. H. Hamence as an additional member of the Committee. Dr. Hamence was unanimously elected.

* * *

The Institute of Physics

At the Annual General Meeting of the Institute of Physics held on Monday, May 22 last, the following were elected to take office on October 1, 1944: *President*, Sir Frank Smith; *Vice-Presidents*, Professor J. D. Cockcroft, Mr. T. Smith and Dr. F. C. Toy; *Honorary Treasurer*, Major C. E. S. Phillips; *Honorary Secretary*, Professor J. A. Crowther; *Ordinary Members of the Board*, Dr. H. Lowery, Professor N. F. Mott, Professor E. A. Owen, Dr. C. Sykes, Mr. R. S. Whipple and Mr. C. S. Wright.

The Annual Report of the Institute once again reflects the important contributions to victory which are being made by British physicists, and records plans which are now being made so that this young profession can continue its vital service for the development of our industries when hostilities cease. In particular, the Board of the Institute has given consideration to the position of physicists and those desiring to enter the profession during the demobilisation period. It is in touch with the Government on these matters, and through the Joint Council of Professional Scientists is co-operating with qualified scientists practising in other branches of science such as chemistry, biology and geology.

The Institute's Report on the Education and Training of Physicists, which was one of the first of its kind to be issued, was very well received, both at home and

overseas. Active steps have already been taken to follow up the recommendations contained in it. Thus the Report making recommendations for changes in the method of teaching mathematics to prospective physicists, which has been prepared by a Joint Committee of the Institute and the Mathematical Association after a lengthy study of the problems involved, is about to be issued, and the enquiry into the "possibility of including the various branches of technical physics within the framework of National Certificates and Diplomas" has made good progress.

* * *

The Royal Institute of Public Health and Hygiene

Sir Stanley Woodwark, C.M.G., C.B.E., M.D., F.R.C.P., D.L., has been appointed President of the Royal Institute of Public Health and Hygiene. He was elected to this office at the last Annual General Meeting.

During the course of the proceedings Dr. Andrew Shinnie, a Member of Council, referred to the sound and excellent position held by the Institute to-day. It had been maintained well during these difficult years, in both the scope of its work and financially, largely as a result of the sound policy advocated and consistently carried out for many years, and particularly during the period between the two wars. He concluded by congratulating the Secretary (Mr. H. H. Gerrans, F.C.I.S.) and the staff upon his and their efforts during the past year and on the results which had been achieved.

* * *

Food Education Society

Among the forthcoming activities of the Food Education Society are:

July 24, 1944. Canteen Catering Conference at 2.30 p.m. at the London School of Hygiene and Tropical Medicine. The Chair will be taken by Sir Wilfred Garrett, H.M. Chief Inspector of Factories, who will deputise for the Rt. Hon. Ernest Bevin, P.C., Minister of Labour. Particulars and tickets to be obtained from the Food Education Society, Gordon House, 29, Gordon Square, W.C. 1.

October 23, 1944. Lecture by Miss Rose Simmonds, Dietitian at Hammersmith Hospital, on "Food and the Sick," at the London School of Hygiene and Tropical Medicine, W.C., at 2.30 p.m.

November 20, 1944. Lecture by Sir Joseph Barcroft. Title to be announced later.

Company

Imperial Chemical Industries

At the Seventeenth Ordinary General Meeting of Imperial Chemical Industries, Ltd., after discussing finances, the Rt. Hon. Lord McGowan, K.B.E., D.C.L., LL.D. (Chairman), spoke of research and monopolies. Of the former he said:

"We have always recognised that the progress of a company such as ours depends to an outstanding degree on the steady pursuance of an active policy of research and development. During 1943 our expenditure in our own works and laboratories was approximately £2,200,000.

"Our research organisation consists of nearly 900 fully qualified chemists, physicists, biologists, engineers and other scientists, together with more than 1,000 skilled assistants. In addition to this substantial force of our own, we also maintain close and cordial relations with Government and University research organisations and with twenty-four industrial research associations, to whose funds we contribute.

"Public attention has recently been focused on great undertakings such as your company. Much of the criticism is ill-informed and political in origin. The word monopoly is widely used as a term of aspersion, and the facile assumption is made that large industrial organisations and monopolistic malpractices are inseparable. My answer is that your company is an industrial oganisation with 180,000 stockholders and 100,000 employees in its own home factories. Its primary interest is in its adventures in industry, carried on by this large human community of individuals associated together in an enterprise of world-wide benefit. Industrial continuity, progress and expansion, with continually rising standards for our employees, growing satisfaction to our customers and a reasonable return to members of the company are more important to us than a maximisation of profit.

"We are inferentially charged with maintaining high prices by restricting production. My reply, and I think it effective, is a pre-war falling price-level for our products, the magnitude of our expenditure on research and development, all directed to an expansion of production and not to its restriction, and our capital expenditure in the sixteen years from 1927 to 1942 at our home works only, on lands, plants, buildings, machinery and equipment, of £62,000,000. In the first five post-war years, I may add, we plan to spend many more millions on new works and extensions."

British Railways

New facts about the railways are revealed in *British Railways in Peace and War*, price one shilling.

Among some interesting data are the following:

Between 1923 and 1942 the British railways spent £450,000,000 on new works and reconstructions; in 1942 passenger travel increased by 50 per cent. and mileage run by passenger trains decreased by 28 per cent.; miles run by loaded freight waggons in 1942 was 32 per cent. over peacetime; the movement of troops to "invasion" stations required one railway to run 116 special trains in 27 days; first exports to Russia involved one railway running 132 special trains between August and November, 1941; forces travelling on duty means railways are now running 2,655 special trains a week; 92 railway vessels have been chartered by the Government for service as hospital carriers, transports, assault ships, minelayers and sweepers, ammunition carriers, ack-ack ships and rescue ships sailing with Atlantic convoys.

Accounts are also given of the big task of moving an army, evacuation schemes, staff, and, finally, post-war services which are being planned. The book is well illustrated.

Information and Advice

Concentrate of Meat Extract

9,154. *During the processing of meat for packing casserole steak there is a very rich residue left in the cooking water. We are enquiring for information as to the possibility of converting this residue into concentrate of meat extract and the formation of meat cubes, together with details of the minimum of plant and machinery required.* (Northern Ireland.)

This cooking water will contain about 2 per cent. total solids, and whether it is worth treating depends on its amount. If it is relatively small it is not worth bothering about.

In order to retain the best properties of the extract contained in cooking water, it is necessary to use a vacuum pan for evaporation, and this, of course, is expensive.

The soup *can* be evaporated in an open steam-jacketed pan, but the quality of the resulting extract is not comparable with the vacuum-evaporated material. However, if you had, say, 100 gallons of the soup daily as a minimum, it might be worth while to evaporate it in a jacketed pan and use for flavouring.

You would want a large quantity of the soup to be able to use it for meat cubes, the manufacture of which is not possible at the present time, as the plant is unobtainable.

Edible Products from Meat Bones

9,234. *Bone, which consists of valuable proteins and minerals, could be put to good use. Bearing in mind the predicted shortage of meat of all descriptions after the war, bones made edible would prove a boon especially in foodstuffs intended for export to Europe. Required, to know what process exists for bones to be reclaimed for human consumption.* (Essex.)

The production of soup stock from bones has been carried out for many years, the bones being the by-products of the canned meat factories. The fresh bones are cooked in water in digestors under pressure, the quality of the bone stock depending on the severity of the treatment and the kind of bone used. The milder the treatment the better the quality of the stock. For instance, the treatment may be for one hour at 5 lbs. per sq. in. pressure or for one hour at 20 lbs. per sq. in. The yield from the latter process will be much greater than that from the former, but the finished product will be more "gluey". When the cooking process is finished, the liquors are blown from the digesters and, after filtration, are evaporated under vacuum to about 25 per cent. moisture.

With regard to the nutritive value of gelatin, which is the main constituent of bone stock, Hutchinson and Mottram state that it is in no sense a substitute for other proteins. Some of the amino acids which are essential for the building up of human protein are not contained in it. As a source of heat and energy, it is equal to protein or carbohydrate, 1 gm. yielding about 4·1 Calories. However, not more than 1 oz. of gelatin can be conveniently taken in a day, so that the usefulness of gelatin in dietetics is of limited range.

Packaging of Bouillon Soup Cubes

9,188. *Required, information regarding the packaging of bouillon soup cubes. The enquirer believes that the method of packing was similar to that used for a cube, but a new method of packing which is being used by one of our allies is to pack the bouillon powder, which weighs ¾ oz., in a very heavy transparent wrapping such as Cellophane or Pliofilm. The machine required to do this form of packing would weigh or measure the material, which is then folded and crimped, evidently a gum or special adhesive being used to help in the sealing. The great merit of such packing is that it lies flat and takes up very little room, the complete package being about 1¼ ins. square. This method appeals to us, a sample having reached us which was packed in America and which was still perfectly dry.* (New Zealand.)

Regarding the material itself for the packing of cubes, we suggest that Pliofilm would be the ideal substance, and you would get full details regarding this if you wrote to Pliofilm, Goodyear, of Wolverhampton, although Pliofilm is not for sale in this country at the present time. It is possible, however, that you might be able to get supplies in New Zealand direct from the U.S.A.

Names of possible manufacturers of wrapping machinery were given.

Information Supplied

9,153. *Detailed information concerning the preparation of apple juice and apple jelly, with special regard to the equipment to be used and, if possible, the suppliers and estimated cost.* (Eire.)

9,155. *On page 72 of the February issue of* FOOD MANUFACTURE *was described a taring scale invented by Mr. A. H. Hewitt. Required, further details of this scale.* (Lancs.)

9,157. *Names of likely suppliers of dried gluten.* (Middlesex.)

9,160. *Names and addresses of manufacturers of potato flour.* (Lancs.)

9,166. *The address of firm specialising in mechanical presses.* (Herts.)

9,172. *Manufacturers of cotton bags suitable for packing self-raising flour.* (Middlesex.)

9,175. *Information regarding adjustment of pH.* (Lancs.)

9,183. *Manufacturers of herring boning machine.* (Western Australia.)

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. the Controller of H.M. Stationery Office. The journal can be obtained from weekly (annual subscription £2 10s.).

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

557,590. BATCHELOR'S PEAS, LTD., and LOCK, A.: Machines for filling bottles or cans with liquid.
557,980. HUGHESDON, W. G., and BEW, T. J.: Methods of drying grass and apparatus therefor.
558,054. FIELD, SONS AND CO., LTD., and CREASEY, B. J.: Cartons or containers of cardboard, paper or like materials.
558,290. NATIONAL OIL PRODUCTS CO.: Method of obtaining oil from fish livers.
558,338. AKTIEBOLAGET ELEKTROLUX: Absorption refrigerating apparatus.
558,490. STANDARD BRANDS, INC.: Process for preserving and retarding the reactivity of easily reactible salts, particularly for use in baking powders.
558,507. R.G. FOODS PARENT CO., LTD., and GOODALL, C.: Grain-drying apparatus.
558,540. MAGG, W. J.: Oil-burning heating stoves.
558,695. PROTECTIVE METAL FINISHES, LTD., and BERGSTEIN, G.: Gaskets and like packings.
558,707. NATIONAL OIL PRODUCTS CO.: Process for treating fat-soluble vitamin-containing materials.
559,664. CRACKNELL, M. W. (legal representative of Cracknell, R. J.): Float-operated valves for regulating the flow of refrigerant in refrigerating systems.
559,691. PILGRIM, E. A. E.: Bean cutting or slicing devices.
559,742. U.S. INDUSTRIAL ALCOHOL CO.: Process of recovering products from fermentation residues.
559,758. ARNDT, W., and HANSON AND SONS, LTD., S.: Production of extracts of tea.
559,768. HESLOP, A. J.: Portable combination stove and heating for cooking appliance.
559,809. ALEXANDER, A. E., and ROBSON, P. T.: Preservation of fruits, fruit pulp and jams.
559,928. BATHGATE AND SONS, LTD., A., and RAYNES, M. T.: Apparatus for drying granular materials.
559,984. REDMAN, R. P., and HARRIS (CALNE), LTD., C. AND T.: Method of and means for producing canned skinless sausages.
559,988. CLARK, D. H.: Box- and drum-type vacuumising and gassing chambers for food containers and the like to enable the said containers to be sealed while still enclosed, at the same time preserving the minimum value of the chamber.

Abstracts of Recent Publications

A Composition for Producing a Potable Brew from Grasses

It has been found that a palatable beverage of excellent quality may be prepared from grasses—for example, cereal grass, pasture grass, sugar cane and the like—if they are properly treated and dried.

According to the invention, the grasses, preferably after being crushed, are allowed to ferment and are then dried at a temperature sufficient to destroy or partially destroy the chlorophyll, but insufficient to char the organic material. The duration of the fermentation will usually be from about thirty minutes to three days, depending on the flavour desired.

To produce a palatable beverage the dried product is boiled or steeped in water.

The grasses are preferably given a preliminary drying to remove a portion of the moisture. They are then crushed so that the plant cells are sufficiently broken down to release the enzymes. The crushed grasses are then placed in a suitable container, where they are left for a period of from thirty minutes to three days. The bacteria on the leaves and the enzymes released from the plant cells bring about fermentation. The flavour of the resulting product is determined by the extent of the fermentation. This period is therefore varied in accordance with the particular taste the product is to have. The enzymes are sensitive to heat, and the fermentation action may be stopped at any time by the application of heat. To obtain a dark-coloured brew it is necessary that the final drying operation be conducted at a temperature sufficient to destroy or partially destroy the chlorophyll in the grasses, but insufficient to char the organic material. After the water has been largely removed a product is obtained that may be stored without danger of decomposition or further fermentation, and a tasty dark-coloured beverage will be produced when the product is boiled or steeped in water.

556,529. William R. Graham, Jr., and Clark W. McCarty.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

FILESSA.—626,324. Flavourings for food (other than essential oils). **William Wilson Brown,** 27, Ratcliffe Terrace, Edinburgh, Scotland; Manufacturer and Merchant.
LORNA DOONE.—626,474. Sugar confectionery, not being biscuits or cakes. **Bristow's of Devon,** Palace Works, Church Lane, Crediton, Devon.
DOREMA.—626,627. Bread, flour; cereal preparations for use as food or as ingredients in food, for human use. **Andrew Taylor and Co. (Glasgow), Ltd.,** 163, Hope Street, Glasgow, C. 2, Scotland.
CHIRPIES.—626,867. Confectionery (not medicated). **The Dales Aspirin Company,** Skipton Road, Silsden, near Keighley, Yorkshire.
DOTEDO.—627,033. Bread, flour, and preparations made wholly or mainly of cereals for human use as food or for use as ingredients in food. **Andrew Taylor and Co. (Glasgow), Ltd.,** 163, Hope Street, Glasgow, C. 2, Scotland.

In the May issue of FOOD MANUFACTURE, page 190, an error occurred in Trade Mark No. 623,615. It should have read:

PANRIC.—623,615. Flour, bread, cereals prepared for human consumption. **Link Elm Products (Worcester), Ltd.,** 12, Silver Street, Worcester; Food Manufacturers and Distributors.

New Companies

Economic Foods Limited. (384287.) 18-20 Market Street, Eckington, Sheffield. To carry on bus. of canners, bottlers, packers, preservers, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: S. Tatlow, 26, Bread Street, Eckington; A. G. Baxter, 89, Forest Road, Mansfield; H. Lindsay, The Grange, Oaklands Road, Forest Town, Mansfield.

Spray Dried Foods, Limited. (384300.) 120-122, Victoria Street, London, S.W. 1. To carry on bus. of food and beverage mnfrs., mnfg. chemists, etc. Nom. cap.: £100 in £1 shares. Dir.: J. Dyer, 55, Highpoint North Hill, N. 6.

Farinaceous Products, Limited. (386835.) 8, Green Lane, Peterborough. Nom. cap.: £100 in £1 shares. Dirs.: J. W. Topley and Fanny Chappell, both of 8, Green Lane, Peterborough.